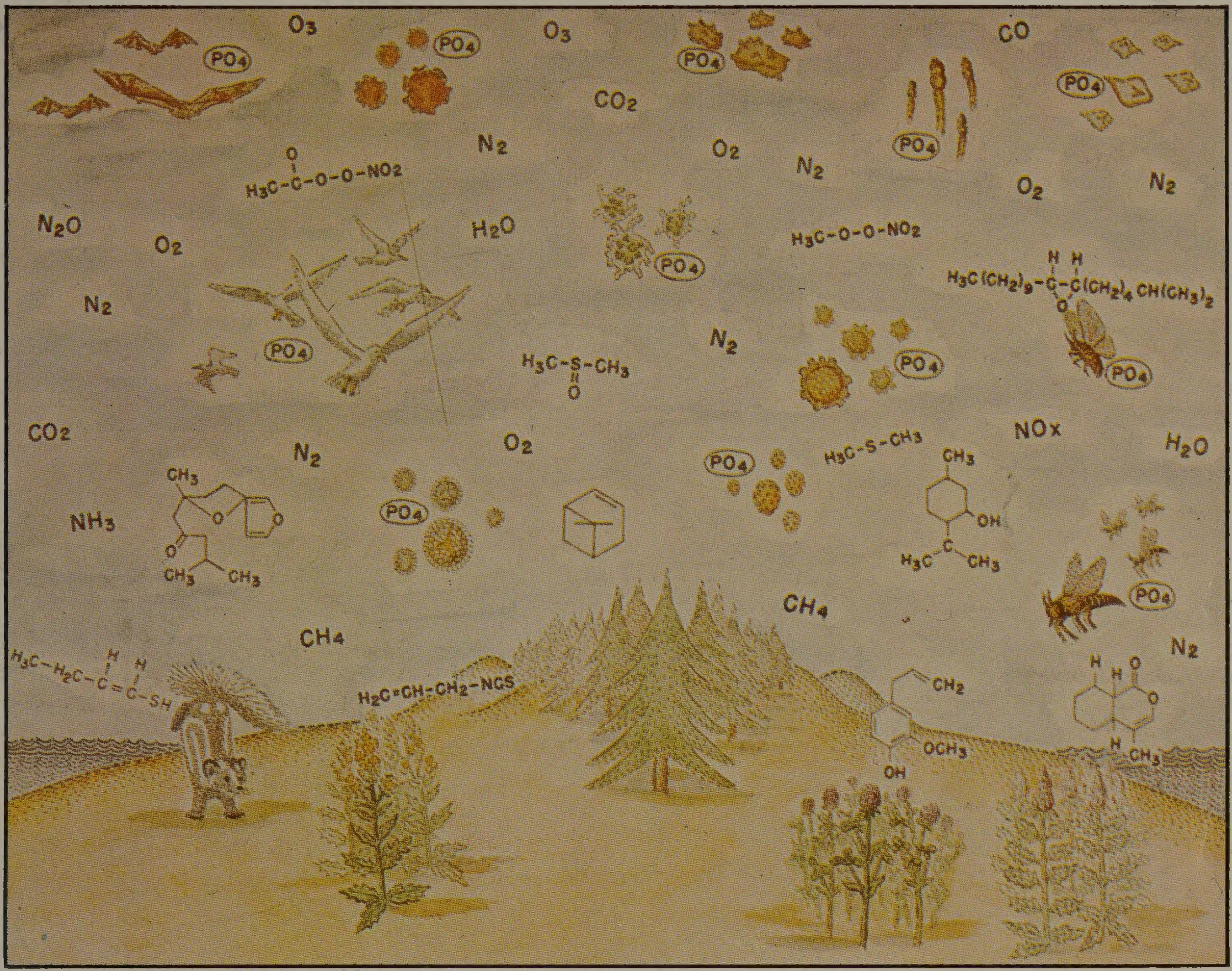
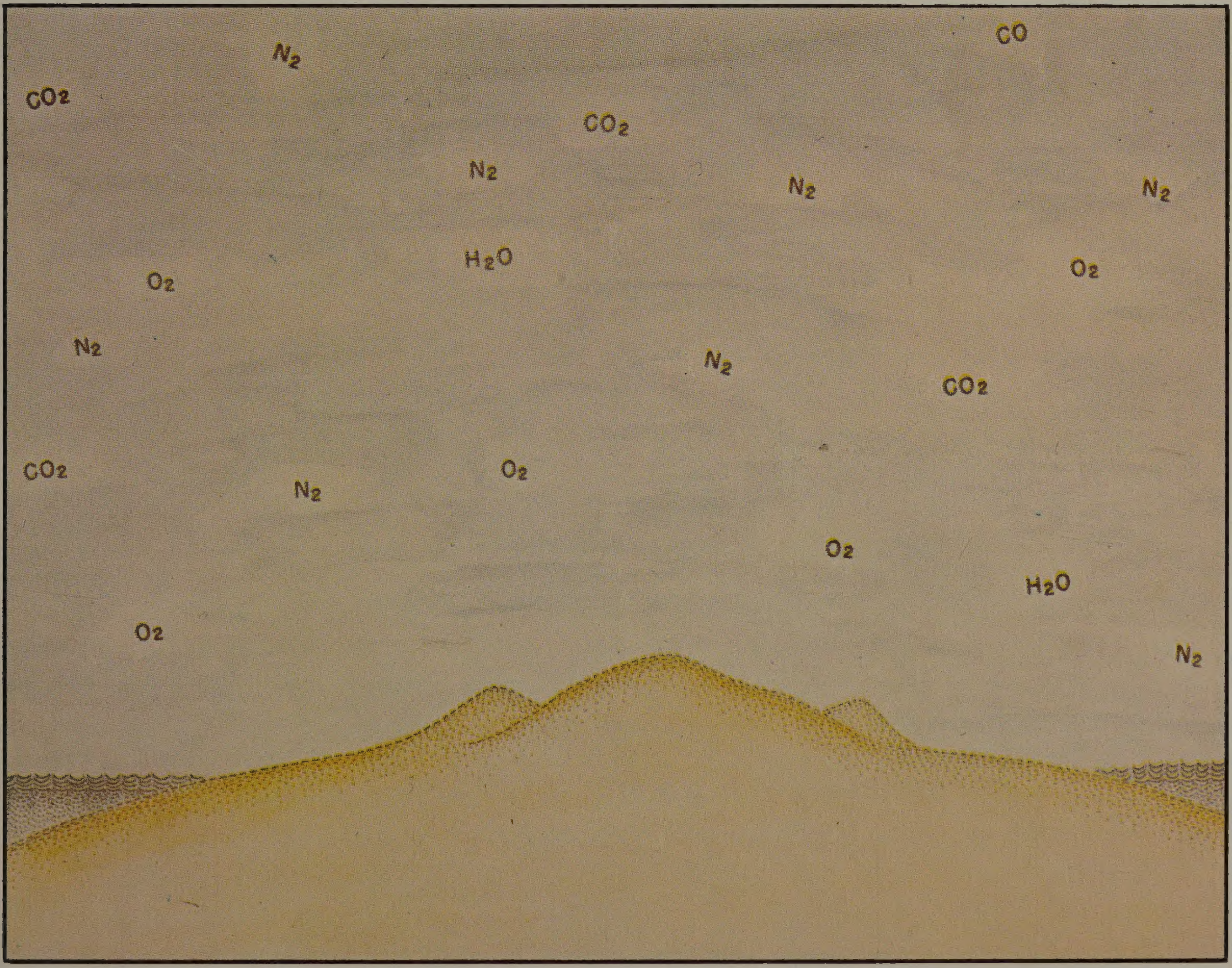
The CoEVOLUTION Quarterly



Earth's atmosphere at present.

The Gaia Hypothesis

The present atmosphere were life deleted.



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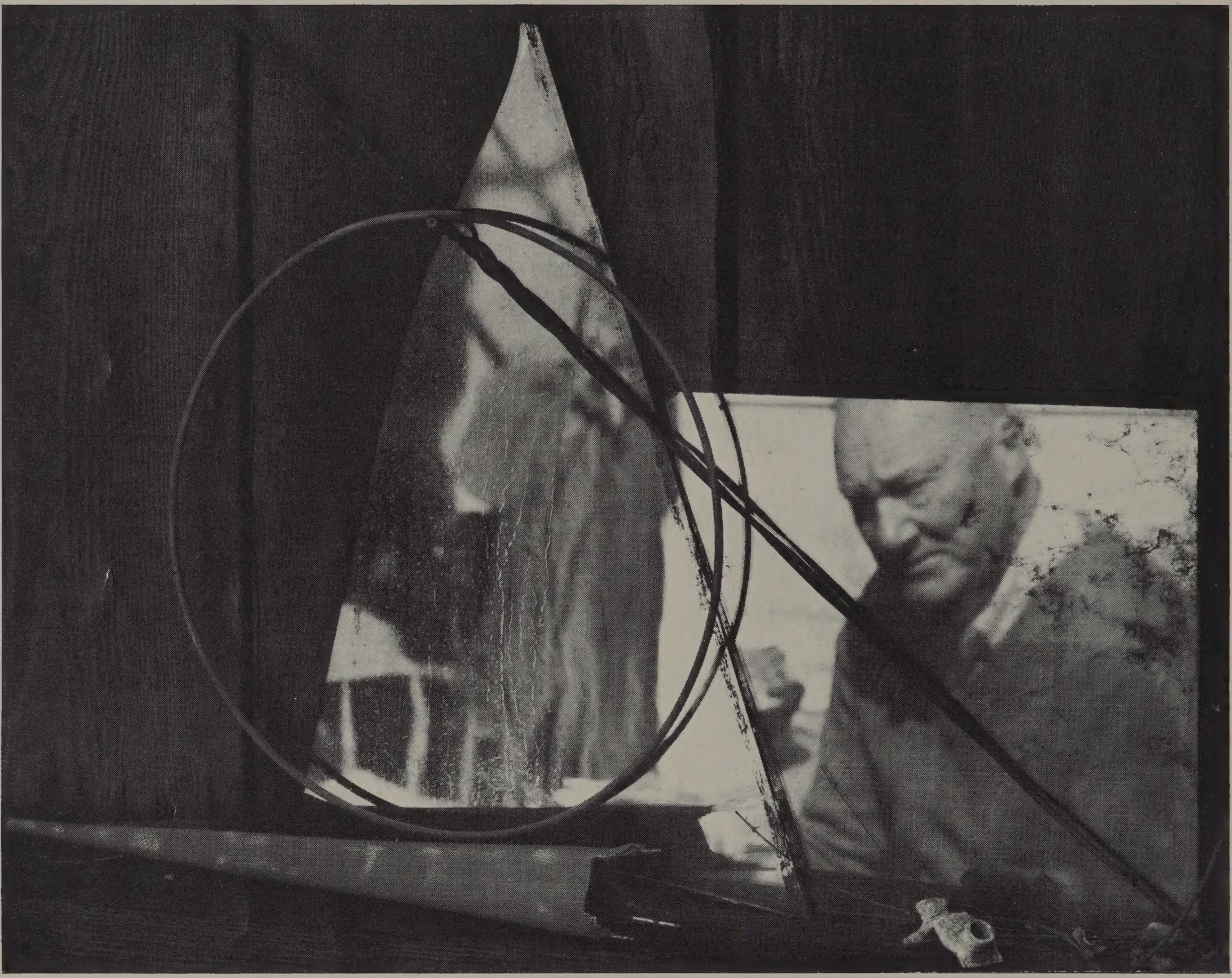

by ANSEL ADAMS – "Robert Boardman Howard, San Francisco, c. 1960"

"As we grow older,
mirrors become windows."

— Ansel Adams, 1964

Cover

Illustrates the article beginning on p. 30, "The Atmosphere as Circulatory System of the Biosphere — The Gaia Hypothesis" by Lynn Margulis and James Lovelock.

Implied in the Gaia hypothesis is the perception of the Earth as a single living creature.

The cover artist — Laszlo Meszoly — is Hungarian-born and Boston-based. He does biological and paleontological artwork for Harvard, Boston University, and their ilk. "Bones and gibbons, that's what he's especially good at," says Lynn Margulis. "He only dips into the Pre-Cambrian when he does our stuff. The rest of it's all Mesozoic and Cenozoic."

The photo by Ansel Adams, opposite, is in his recent New York Graphic Society book, Ansel Adams: Images 1923-1974.

—SB

Apocalypse Juggernaut, hello.

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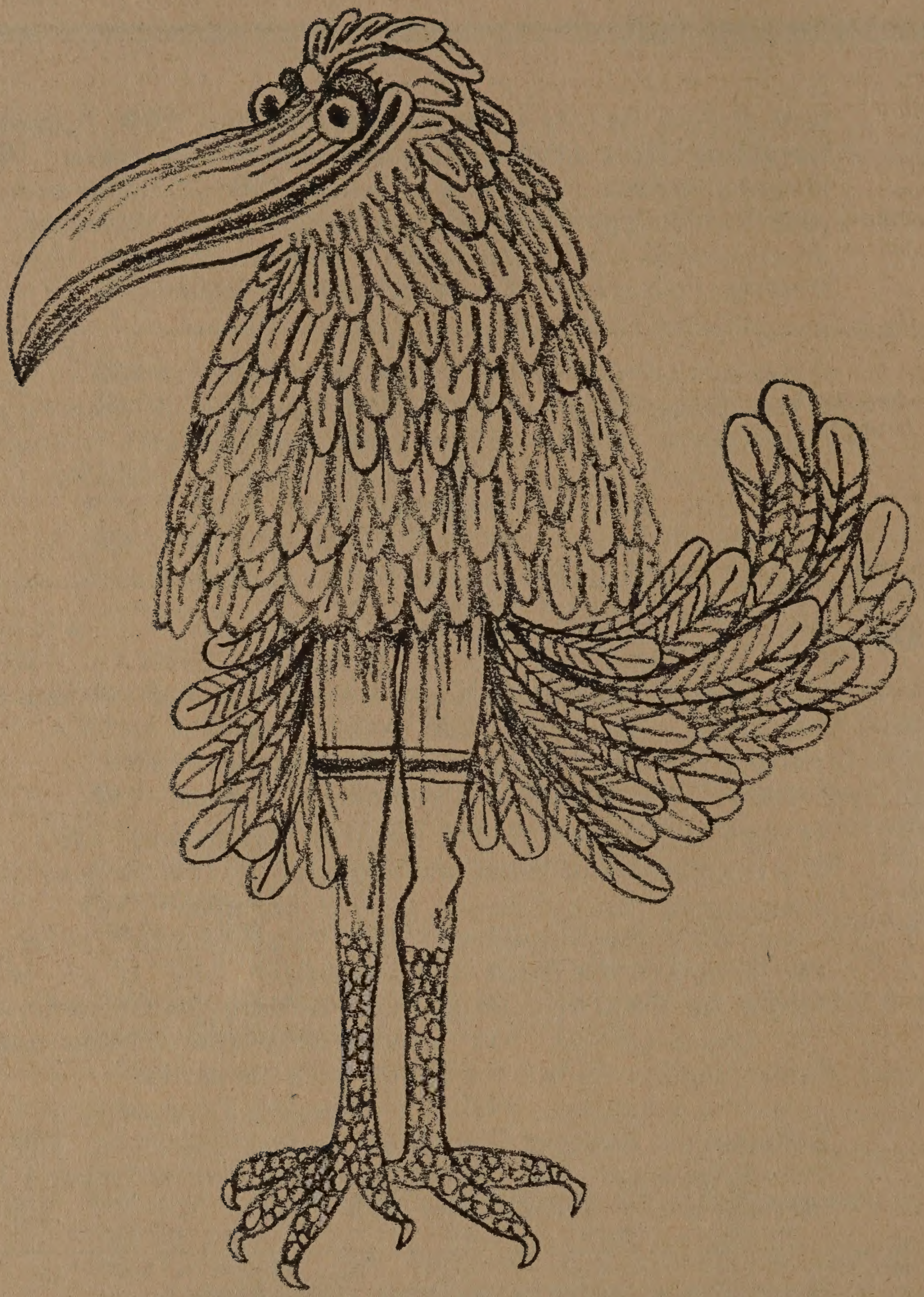
Apocalypse Juggernaut, hello?



A bird in a bird costume, a creature without moral or caring or any other "human" attribute except humor. Trickster. I've recognized him lately, after fifteen years of wondering. He's become my image of that dangerous 20th Century deity, THE FUTURE.

He adorns the cover of the 1960 paperback of G. K. Chesterton's masterpiece, The Man Who Was Thursday (currently being revived in book and TV). The artist was Milton Glaser.

—SB

Lessons

Thanks to the triple blessing of the lost cause in Vietnam, the loss of control in the Energy Crisis, and the loss of innocence with Watergate, general prospects for America are now better than they've been in years. Three public humiliations in two years has put the country in Learning Mode.

The lesson of Watergate is Never Trust a Government. Already we are seeing improvement in the quality of representative that a burned, skeptical, informed electorate can select. Unfortunately this process has also made us obsessed with government and the media. There's a problem box and a solution box, Ken Kesey maintains. No matter how earnestly you look, you won't find your solutions in the problem box.

The lesson of the Energy Crisis is If You Spend Capital (oil) As If It Were Income, You Live a Short Flashy Life. America is third-generation rich, famously wastrel. The Arabs are first-generation rich, with riches we had considered ours. In the resulting delicious come-uppance we have been forced to re-assess where "ours" begins and ends. With the limits to material growth in sight, a central madness — cornucopia — begins to get well.

The lesson of Vietnam has to do with money versus turf, or even with money versus virtue. We had grown used to buying our victories. In the U.S. Civil War the North sent more shoes and cannon to the South than the Confederate horsemen could keep up with — and a disastrous victory resulted. Later in the Atlantic the amazing German U-boats were simply flooded with klutzy Liberty Ship targets — and we victors went crazy in a world of our own (apparent) making. The world was purchasable, and we had the cash. Vietnam proved otherwise.

So it's back to basics. The quality of land — sustained rather than spent. Homeland. The quality of people — their education, responsibility, humor. The blend of dependence and independence among citizens and among nations that keeps open the choices between cooperation, competition, and count-me-out.

China has made national count-me-out look very effective indeed.

An old joke says that the lake with the longest name in the world is called — in a single native American word — "You-fish-on-your-side-we'll-fish-on-our-side-nobody-fish-in-the-middle."

"Nobody fish in the middle," is a formula for a perpetually livable planet.

— SB
29 May 1975

Notes

Ample oil this year *is the word from* **Oil & Gas Journal** *(May 19, '75). "There currently is an oversupply of gasoline which may continue well into the summer . . . . Demand is simply not living up to expectations. Consumers are cutting back on fuel usage because of high prices, the economic recession, and the general acceptance of the long-term need to conserve on energy . . . . The big story in the marketplace is the strong resurgence of private-brand and independent [gasoline] marketers."*

Economic up and then down *is the consensus scenario among "realists" writes Hugh Martin from Mill Valley, California: "Optimist Milton Friedman looks for one good year, 1976 — with inflation down, unemployment falling, and production increasing — then 20%+ inflation starting in 1977. Walter Hoadley, chief Bank of America economist, sees a halting recovery, followed by a precarious and unsustainable boom in 1977-78, leading to an economic collapse much more severe than the present crisis. Analyst Tom Holt, however, predicts that even monstrous government spending 'will not prevent the current Depression from materializing.' " The CQ's economic advisor, Dale Jorgenson, on the other hand, perceives only a steadily persisting recession. The rising Stock Market, like its recent plunge, is strictly a result of monetary policy — high interest rates before, low ones now. Both interest rates and the market should stay the same for a while.*

Eventual coal gasification *is the hidden agenda of the oil companies, says James Ridgeway (see his monthly,* **The Elements,** *$5/yr. from the Transnational Institute, 1520 New Hampshire Ave., Washington, DC 20036). It's why they bought up the U.S. coalfields in the early '60's, why they exacerbated the Energy Crisis, why they claim natural gas shortage. The key is the natural gas pipelines, which are federally regulated. Those pipelines could carry natural gas, synthetic gas (from coal), or hydrogen gas (the only income medium — see "Energy Choices", Spring '75 CQ), or a combination.*

Potential next nuclear powers *were evaluated in detail in the Apr. '75* **Scientific American.** *They are: Pakistan, Argentina, Brazil, Chile, South Africa, Israel, Egypt, Spain, West Germany, Italy, the Netherlands, Belgium, Switzerland, Japan, South Korea, Indonesia. Signers of the recent Nonproliferation Treaty that could change their minds if they wanted include: Canada, Sweden, Taiwan, Australia, Norway, Iran, East Germany, and Czechoslovakia.*

Dale Jorgenson, *econometrician, notes that his prediction (Winter '74 CQ, p. 10) of Paul Mac Avoy's appointment to the Council of Economic Advisors came precisely true this week, two years early. He says it reflects Greenspan's restoring of objectivity to the Council's pronouncements, reversing a bad trend in recent years. Jorgenson quotes with approval Theodore White's "Chappaquidick Theorum," that the sooner and in more detail you announce bad news, the better.*

The real futurists are not futurists, *observes David Lyle from South Acworth, New Hampshire. "In Spring '75 CQ you comment on the reliables in the prediction game. You mention Ehrlich, Paddocks, and ask who else? In 1965-'66 I wrote an outline for a book. It was published in Esquire in 1967 as an article — "The Human Race Has, Maybe, 35 Years Left." After reading CQ I looked the article over, and while there are some changes I might make now, it was pleasant to see I didn't have to apologize for it almost ten years later . . . .*

I should add — having taken the bow — that very little I wrote was original. I tried to draw together more strands than I had seen anyone else do before. But it was the work of other people that got me into all this — and I think first of Bertrand Russell and Julian Huxley. Rapidly followed by Norbert Wiener, Charles Elton, Hans Selye, Lewis Mumford, Carl Sauer, V. C. Wynne-Edwards, John B. Calhoun, Lester Brown, Kenneth Boulding, Pierre Gourou, William Vogt, Toynbee. Plus others I've missed, I'm sure. So while you're toting up the other reliables, consider them. Most were not specifically in the future business — but as acute observers of the present or the past, they shed more light on the future than most futurists do."

Captain Kirk, Something Funny's Going On In The Transporter Room

In case you like to dismiss Buckminster Fuller's wilder predictions, consider his repeated insistence that we would soon find proof of human and animal "telepathic" communication via ultra high frequency electromagnetic wave propagation and reception.

Reconsider it, that is, in light of the following report from the Jan. 30, '75 New Scientist:

> Animals may communicate by microwave radio, according to two Canadian scientists. This remarkable suggestion comes from studies of the possible dangers of relatively weak electromagnetic radiation, for example close to radar equipment and microwave ovens. But it provides a possible explanation of non-verbal communication between animals — in effect, of telepathy.
>
> J. Bigu del Blanco and Cesar Romero-Sierra of the anatomy department of Queens University, Ontario, working on a National Research Council of Canada grant, looked at the microwave emissions at 8.95 GHz from a man and a rabbit. They found that not only

Judy Van Slooten

Would being transceived feel like this?

did both produce the natural microwave background expected from any radiating warm body, but also signals well above the background. Measurements were taken of signals from the abdomen of a man (with the antenna 4 m away) and from the man's hand and a rabbit's head (with the antenna 0.5 m away). Signals were found in all cases, and in the case of the rabbit, different size signals corresponding to different states of stress . . . .

Romero-Sierra and del Blanco do not actually suggest a mechanism, but they do "call the attention of the reader to an interesting hypothesis in which DNA molecules are regarded as RF signal generators, RNA as amplifiers, the cell wall as a noise filter, and enzymes and amino acids as effectors of signals".

The paper was first given at an obscure National Science Foundation sponsored, invitation-only conference in Aspen, Colorado nearly two years ago, but the proceedings of the conference have just been published (Biologic and Clinical Effects of Low-Frequency Magnetic and Electric Fields, by J. G. Llaurado et al, published by Charles C. Thomas, Springfield, Illinois).

Now then. Fuller remarked in the Spring '75 CQ that, "Before the close of the 20th century humans may well be transceiver transmitted from here to there by radio . . ." A practical application of Norbert Wiener's 1950 statement, "We are not stuff that abides, but patterns that perpetuate themselves. A pattern is a message, and may be transmitted as a message."

Very well, here speculation begins. What can be transmitted can as well be multiplied. Somewhere in the process of transceiving himself from White House to Key Biscayne to Camp David to San Clemente, it would have occurred to Nixon to simply leave one of himself at each location. Then to replace various of his faltering staff with more reliable men — further Nixon replicas. Then to put himself on tape, quite a few copies, so we would get a fresh 62-year-old President every January. Until never. Immortality for who, and not for who?

That's my nightmare. J. Baldwin's is that what can be transmitted can be poorly transmitted. "We're sorry Mrs. Baldwin, but J. got scrambled in transmission." "Oh well, feed him to the cat."

Enter computers, which could make specific alterations in the message of you. A spare arm or other organ. Bigger you; smaller. Change race. Change sex — would a replica of you, oppositely sexed, be interesting to make love with?

Would a 3-dimensional xerox multiply money? Gold? — oh alchemical and problematic.

Marc Le Brun says that Larry Niven's science fiction (Flight of the Horse) *foresees that we would be plagued with "flash crowds" wherever something interesting was happening.*

Change species. Change centuries (forward, at least). Have young replicas instead of children.

Change your mind.

Comments?

Sagan's Conjecture

One intended function of The CQ is to be a conversation pit for cooked and half-cooked cybernetic ideas. For example:

> **SAGAN'S CONJECTURE**
>
> **"If the energy-per-pulse flowing through and interacting with a system is greater than the binding energy of the least strongly bound component of the system, then there will be a net loss of order in the system.**
>
> **Conversely, if the pulse energy is less than that of the weakest bond, there will be a net gain of order in the system."**

Dear Ramón Margalef
Gregory Bateson
Howard Odum
Harold Morowitz
Heinz Von Foerster
Carl Sagan

I have been searching some while now for organizing principles on the conceptual barricades between energy and information.

During the course of a lecture last week at Cornell I quoted Harold Morowitz *(Energy Flow in Biology)*, "The flow of energy through a system acts to organize that system," and Ramón Margalef *(Perspectives in Ecological Theory)*, "Pumping more energy in and out of a system simplifies it."

Carl Sagan, exobiologist and space scientist at Cornell *(Intelligent Life in the Universe)*, said after the talk that the two apparently contradictory biological statements would make perfect sense to a physicist, and he stated why. That statement — attached — we're calling Sagan's Conjecture.

And I'm probing around with it. The principle would seem to explain why fire burns down and respiration builds up. Or why energy-intensiveness has over-simplified American agriculture. Carl says it explains why mild sparks in a jar of methane and other gases make for amino acids instead of ashes (gas ashes).

If the conjecture seems to hold up under scrutiny I expect to publish it in the Summer *CoEvolution Quarterly* (along with lengthy excerpts from Margalef's book).

This letter is to request your comments. Is the conjecture original, non-trivial, disprovable, accurate, well-enough-stated . . . is it interesting? Useful?

Stewart Brand
The CoEvolution Quarterly

The idea neatly dissects energy and information components of a system — energy passing through, and energy binding; and information in the finding of the weakest link and the comparing of the two energies.

Energy in; energy plus information out.

Sagan's Conjecture could be the boundary statement between physics and biology — it could explain the conditions and sequence of the origins of life.

It might also explain the deeper structure of Lotka's Principle — that evolutionary advantage generally goes to the most energy-stingy system.

Some questions raised by the Conjecture: Is this the only way that systems gain or lose order? Is rate of order-increase steadily proportional to weakness of energy pulse — the weaker the pulse the more order? To what limit — when is the pulse too feeble to count? What does the Conjecture offer when both energy and information are entering a system?

Even meaner questions came from the correspondents.

Ramón Margalef (whose "Perspectives on Ecological Theory, begins on p. 48) replied favorably. (By the way, I'm no Dr.):

Dear Dr. Brand:

Probably I agree with you and with Dr. Sagan. The best example is in radiation; UV radiation destroys structure, light can be trapped and used as energy source. All depends on the nature of matter and energy, on relation between atomic distances and wavelengths. Organisms need energy, but too much energy may burn or mechanically destroy them. When I wrote of "pumping" energy I had in mind something intermediate, something that can be managed by the system, but that is "forced" from outside, like mixing, upwelling, polluting. In cybernetic terms I believe that the distinction is more clear. A) The system has no control, and is destroyed by energy input; B) The system is not destroyed, but has to change to accommodate a higher energy flow (my case, and the examples of upwelling, pollution, agriculture); C) The system remains in full control, even of the energy input. It is like a thermostat: A) you can burn or freeze the room using such energy that the thermostatic system is helpless; B) you can keep the thermostat fluctuating wildly, and the room perhaps fluctuating a bit, but you get through; and C) you can achieve a good control, if energy changes are kept small.

Sincerely,
Ramón Margalef
Barcelona, Spain

Gregory Bateson was unthrilled by Sagan's Conjecture. He distrusted its ambition to span too many levels of organization. "Suppose you have a family or something — a group of people who trust each other. Then you introduce the assertion that one of them is a spy. Does Sagan explain the net loss of order in the group?"

Howard Odum did not remark.

Harold Morowitz, on temporary duty in Berkeley, insisted we get together for detailed discussion. We met for dinner at the house of poet Michael McClure, who is avid fan of **Energy Flow in Biology**. *Morowitz's major objection to the statement was the notion of energy pulse — he said what we should be looking at is rate of energy flow.*

Later on the phone he put it this way, "Suppose we were much closer to the Sun — say on the surface of Mercury. We would not be organized. We'd be too close to the equilibrium of the Sun. The same thing if we were too far from the Sun — we'd be close to the equilibrium of outer space. Equilibrium is always death — whether it's fire or ice. The crucial thing is to be intermediate.

"I think there is some statement there in Sagan's Conjecture, but we don't quite understand it yet. You need some kind of tension between the energy coming in and the 2d Law of Thermodynamics leading to the leak of energy out."

Incidentally Morowitz was moved by his evening at the McClure's to write a poem, which appears on p. 186. You might also enjoy his book, **Energy Flow in Biology** *($13.00 postpaid from Academic Press, Inc., 111 Fifth Ave., New York, NY 10003, or Whole Earth). One time he froze brine shrimp eggs to nearly absolute zero. Thawed, they made brine shrimp. "Biological information," says Morowitz, "is structural."*

Heinz Von Foerster was delighted with the topic but dismayed by the juxtaposing of energy-per-pulse and binding energy — the first introduces time (energy-per-time is "power") and the second does not. Oranges and orangutangs are not equivalent. I said I thought the introduction of pulse, of time, might be critical to understand how flowing energy and binding energy impinge on each other.

Heinz added that he thought Ross Ashby had made a more fundamental statement. His colleague Stuart Umpleby wrote with the details:

Dear Stewart:

Heinz has asked me to reply to your letter on self-organization. He is very busy, and apparently he thought the practice would be good for me.

The current state of the art of the theory of self-organizing systems, as I understand it, is due primarily to Ross Ashby and also to Heinz Von Foerster. Ashby began developing his ideas in Design for a Brain published in 1952 and stated them most succinctly in two papers written about 1960, "The Self-Reproducing System" and "Principles of the Self-Organizing System." Basically two processes are involved — differentiation and selection. Differentiation or the creation of new alternatives for selection can result from combination, decomposition, mutation, etc. Ashby tended to emphasize the very general nature of selection. Selection is applicable to virtually all systems, not just biological systems. Von Foerster tends to emphasize differentiation more than selection. But both processes are essential for developing really complex systems.

Ashby's key statement is, "Every isolated, determinate, dynamic system obeying unchanging laws will develop 'organisms' that are adapted to their 'environments'." He explains the theorem as follows:

> *The argument is simple enough in principle. We start with the fact that systems in general go to equilibrium. Now most of a system's states are non-equilibrial . . . . So in going from any state to one of the equilibria, the system is going from a larger number of states to a smaller. In this way, it is performing a selection, in the purely objective sense that it rejects some states, by leaving them, and retains some other state, by sticking to it. Thus, as every determinate system goes to equilibrium, so does it select. We have heard ad nauseam the dictum that a machine cannot select; the truth is just the opposite; every machine, as it goes to equilibrium, performs the corresponding act of selection.*

In this usage "organism" and "environment" are parts of "the system", so "organism" could refer to a molecule, a species, a person, a magazine, a nation, etc. Ashby uses the word "system" here to specify the universe under consideration. If the original system is not very complex, the "organisms" and "environments" that evolve will be quite simple (see the numerous examples in the article "The Self-Reproducing System"). However, if the original system contains considerable variety, for example a community or an ecosystem, the "organisms" and "environments" that evolve can be quite complex.

We can now rephrase Sagan's Conjecture in Ashby's terminology, which seems to me to be more general. Equilibrium specifies a relationship between the organisms and its environment. Thus *the equilibrial states between an organism and its environment will be different for different environments.* For example at one environmental temperature, or level of energy, molecules may combine to form more complex molecules such as amino acids. At another temperature, or level of energy, the same molecules, while going toward equilibrium, will form gases. Similarly a child growing up in Viet Nam will learn to speak Vietnamese. The same child raised in the United States will speak English.

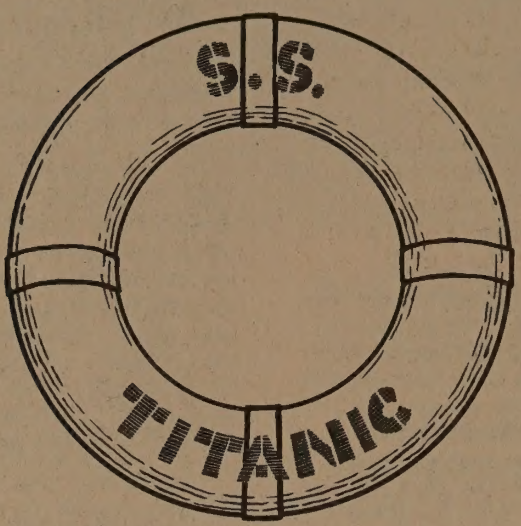
It is misleading to say that energy per se organizes or simplifies a system. This would be a judgment made by an observer. But every organism and its environment tend to go toward equilibrium, and every system, containing organisms and environments, will tend to select out for survival the equilibrial states over the non-equilibrial states. Systems of sufficient complexity will also tend to generate new alternatives due to random processes, mutations, new associations or combinations, etc. . . .

Best regards,
Stuart A. Umpleby
Institute of Communications Research
University of Illinois
Champaign, Illinois

Well, reader? What's Sagan's Conjecture to you, or you to Sagan's Conjecture?

— SB

WHAT DO WE USE FOR LIFEBOATS WHEN THE SHIP GOES DOWN?



BY MY

It is doubtless false to say that what is determined is what has ceased to live. Yet nothing is determined but what has been lived. God himself, if he existed, could not modify the past. But the future belongs to him neither more nor less than to man.

— Albert Camus

My is admired by other writers such as Norman Mailer and Ken Kesey as one of the gentlest, clearest journalists in the business. For years he has periodically emitted **Observations from the Treadmill**, *a pay-as-you-go personal journal recently accumulated into book form (EPILOG, p. 680 — now in paper, $4.95). At present he is guest-editing an issue of Kesey's* Spit in the Ocean *($5 for subscription, SITO, Box 477, Rt. 8, Pleasant Hill, OR 97401).*

The following is from a forthcoming (January '76, Harper & Row) book of the same title. It is what My did with a travel-to-distant-parts-plane-fare grant of $1,900 from POINT. The drawings are by cartoonist Jay Kinney, whose work appears in Arcade *— "the Comics Revue" — from Print Mint, Berkeley, CA*

This article comes at a time between two periods of public hand-wringing about famine — last year and next year. My's "lifeboats" demonstrate that there are better things to do with your hands than wring them.

— SB

Passengers

We are eating dinner.

"They said at school that we should all go without lunch tomorrow and give our lunch money to the starving people."

"Who said?"

"I don't know."

"Who's collecting?"

"I don't know, but everybody's gonna bring lunch so they don't hafta miss a meal."

"Who's everybody?"

"All the kids."

"Is that what you're going to do?"

"Uh huh. Mr. Brown says we should. He says as long as everybody else is talking in favor of fasting, somebody ought to talk in favor of eating. Mr. Brown says they have all these holy cows walking everywhere in India while their people are starving. He says the Moslems tried to buy the cows but the Hindus wouldn't sell them, and he says the people refuse to practice birth control, and . . ."

"Who's Mr. Brown?"

"He's our History teacher, he must weigh two hundred fifty pounds! And he says the Africans are all messed up anyway, and besides if you give the money most of it never gets there, so Mr. Brown says he's not about to give up his lunch because it's not his job to feed the world."

"What do you think?"

"Well I think the part about birth control may be . . . they shouldn't refuse to practice birth control."

"Do I get equal time with Mr. Brown?"

[Sigh, exaggerated.]

"Are you aware of the fact that your father is an expert on the subject of starvation?" (Compared to them, she means.)

Copyright © 1975 Observations from the Treadmill

"I think you ought to listen to what your father has to say."

Another sigh, more exaggerated.

"You mean it's okay to listen to Mr. Brown but not to me?"

"Gee, Dad, if you don't listen to Mr. Brown, he throws you out of the room!"

How is it possible to be born in 1960, live through the most formative years of your life during the most exciting and mass-educative decade in all of history, know more than any other generation ever knew at the age of fourteen . . . and not understand any of it?

When I was a kid, who knew? Waste not want not, there are starving children in Europe, turn out the light when you leave a room . . . Depression psychology. It was money they were worried about, not resources. But while they sat in our front room reading the Evening Express in semi-darkness because it wasn't dark enough yet to turn on the light, Humphrey Bogart was taking a deep pleasureful drag on his cigarette in Casablanca and John Wayne was fighting the good war against the bad Japs in Guadalcanal and Gregory Peck was wearing his suave gray flannel suit in New York. The car got bigger, the kitchen got easier, the steaks got thicker, DuPont was making better things for better living through chemistry, and you could be sure with Westinghouse. Who knew?

Well we know now, don't we, it's on color television. But so was Vietnam and so are The Waltons. And Mr. Brown who teaches Ninth Grade History doesn't think it's his job to feed the world.

The Titanic & The Iceberg

Doom is nothing new. It's been hanging around since the days when we were swinging from the trees, before that even, so to tell you the truth it doesn't much bother me. (Do you hear, Doom?) What does bother me is that lately Doom has been getting too many helpers (Oh, you're writing a Doomsday book? No I am not writing a Doomsday book, I don't even know what a Doomsday book is, and who says Doom has to have a Day?) and for one thing, all these helpers are making it very difficult to keep an eye on Doom, which I still try to do if only to keep some perspective.

One of Doom's helpers is Crisis. For ten or fifteen years now, Crisis has been mesmerising us with fear — civil rights, assassinations, education, drugs, crime, dissent, war — it's a tennis match and Crisis is the ball, only the players keep changing — oil, food, Watergate, Middle East — and by now so many have gotten stiff necks that they have stopped watching altogether, which you might say is a Crisis Crisis. It sure does make it hard to keep an eye on Doom.

I made a trip around the world not long ago — Australia, Hong Kong, India, Israel, Turkey, Italy, England — and I think that I learned a great deal, but when I got back the tennis match was still on — energy, starvation, inflation, recession, unemployment — more had stopped watching, and no one seemed to know where Doom was. I have a friend I like to see, she's from Belgium but thinks Parisian, and one day I dropped by her house. We got to talking about my trip which means we talked about world problems and solutions and, good hostess as she is, she served a number of imported cheeses and a very nice wine. It was at that point that she said that as deplorable as conditions had gotten in the city, she could not think of parting with its cultural refinements. In fact, she said alluding to world solutions, these refinements which she had cultivated all her life — good food, fine wines, music, theatre, dance art — were of such importance to her life that she was quite unwilling to sacrifice them. Yes, I said, but suppose you were enjoying them at the expense of someone else's life? Then, of course, she said, she could no longer continue to enjoy them.

How can I convince her that then is now?

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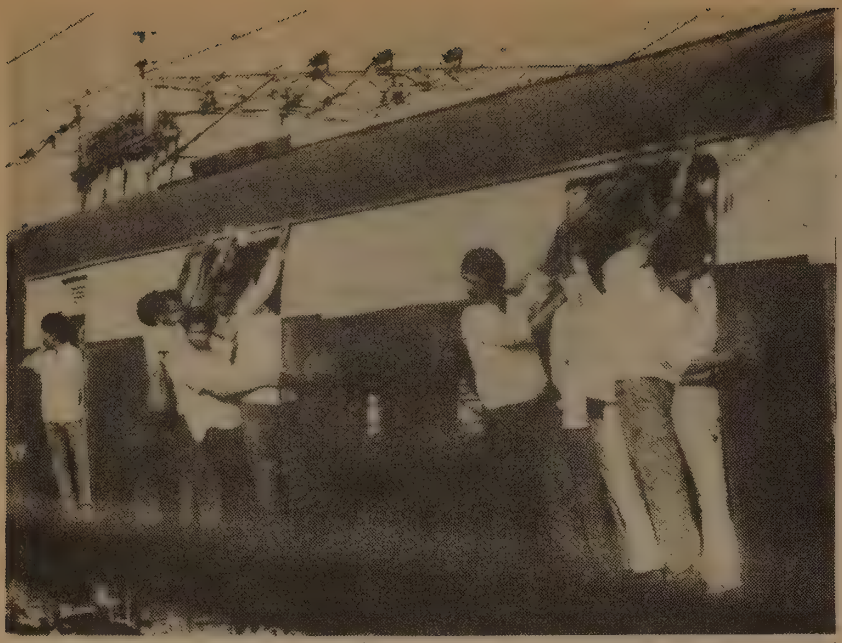
[more →]

Scratchboard illustrations by Jay Kinney



My

"The train is your typical Indian 'businessman commuter' (3rd Class)."

The population of the world is nearly 4 billion. At its current growth rate of 2% per year, it will double in 37 years. The population of the United States will double in 63 years, the USSR in 63 years, Brazil in 22 years, Nigeria in 28 years, Indonesia in 31 years, Australia in 175 years.

In 1972 the infant mortality rate of whites in Louisiana was 19.5 per thousand births, of non-whites 32.3; maternal mortality rate among whites was 1.7 per thousand, among non-whites 6.8.

At the World Population Conference in Bucharest in 1974, the UN released its projections: a low of 9.8 billion people by the end of the 21st Century, a medium of 12.3 billion people by 2125, a high of 16 billion people by 2135.

Country	mid-'71 pop (mil)	per cap GNP $	life expect (yrs)	infant mortality per 1000	literacy %	'71 per cap energy use (kgms)
Bangladesh	83.4	70	46	125	22	n.a.
Ethiopia	26.8	80	39	162	5	32
India	600.4	110	51	139	34	186
Pakistan	68.3	130	50	142	16	96
Brazil	95.4	460	61		67	500
China	787.2	160	50	50	25	561
Indonesia	119.2	80	48	125	43	123
Nigeria	56.5	140	37	157	25	59
Australia	12.7	2870	71	17	98	5395
Canada	21.6	4140	72	18	85	9326
USSR	245.1	1400	70	23	99	4535
US	207.0	5160	71	19	99	11244

". . . every country must develop individual plans for ensuring that their own pre-school children should eat sufficient nourishing food. The importance of doing this cannot be over-emphasized, because protein-calorie malnutrition in early life can lead to physical and mental retardation which may not be reversible. If such damage has been done, the consumption of extra protein in adult life will not repair it and if such damage is widespread in a country, it will likely impede that country's future development in almost every respect.

"The size, urgency and rapid emergence of this problem must be fully understood. About half the population of the developing world is under the age of twenty years and about a quarter is below the age of eight. Thus, the number of growing children is already very large, and, irrespective of the effectiveness of present and future programmes to limit population growth, the young people already alive will themselves soon become the parents of yet more children."

U Thant

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I am in a pub near the University in Melbourne with two Aussie friends, Ric and David. It's Saturday night. The pub is very crowded, very loud, and full of smoke. Young intellectuals and not so intellectuals in hippie clothes share their boredom drinking grog and listening to a very black Aboriginal with thick smiling lips and bloodshot eyes who is banging violently on his guitar, down to four strings now, and bellowing bawdy Aussie songs in a husky voice slurred through an alcoholic haze. They're bored. They'd rather be smoking dope in Greenwich Village or Picadilly Square. Except for Ric and David. They've been there. David: "This is the 'Melbourne Scene'. Here's your typical Aussie pub. When you think of the two of us in Australia, this is where we will be." Ric is bitter. David is cynical. I am depressed. Closing time. Shuffle out the door, eyes burning from the smoke, ears ringing with the noise. A cup of cappuccino up the street. Six pool tables in the back, occupied. We drive to a friend's. Six or seven guys and girls in their late twenties sit in a high-ceilinged livingroom on old junk furniture or on the floor in front of a brick fireplace burning a few pieces of scrap wood. Several other rooms with mattresses on the floor and a dirty kitchen. The friend is still at work, night clerk at a motel. We sit. Nobody talks. They pass a joint, but nobody talks. For three hours. Afterwards, David explains that they are actors and artists. Why didn't anybody talk, I ask? They have nothing to say, he answers.

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Philadelphia 16 Oct 74 — Dr. Jay Forrester, a professor at MIT, in a speech entitled "The Limits To Growth Revisited" given at a two-day conference of scientists at the Franklin Institute said, "We are at a point now where we must give up the idea that good is good in the ideal sense and realize that what is good now may be bad in the future . . . . There has always been a degree of triage in the world. In many cases it has been necessary to build for the future at the expense of the present." As an example he said that limiting agricultural output and thereby restricting export of food to poor countries would not have a great impact on the hungry but could have a beneficial effect in keeping population down.

Brazil has a population of 100 million. It does not favor birth control. It believes that doubling its population will be a step toward becoming a world power.

China has one of the most effective population policies in the world, with contraceptive pills in paper form like edible postage stamps and communes decide which of their members may have children each year. Early marriage is discouraged. China's population growth is only 1.6%, lowest among all the developing nations and well below the world average.

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Melbourne looks like Philadelphia fifteen years ago. Trim not quite elegant middle class suburbs, a well manicured park, new construction, heavy traffic, nicely dressed conservative hard working not very political people who enjoy watching "footy," smoke a lot of ciggies, drink a lot of grog, call each other mate, and don't seem to smile very often. Four hundred and sixty-two miles northwest along the coast is Adelaide, capital of South Australia. Adelaide is Philadelphia twenty years ago. Same suburbs, same park but prettier now, less construction, less traffic, fewer people. The young people in Adelaide are bored. They want to go to Melbourne.

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In an audience with delegates to the World Food Conference in Rome, Pope Paul VI reiterated his opposition to the use of contraceptives and population control. Earl Butz, United States Secretary of Agriculture commented to a reporter: "He no playa the game, he no maka the rules."

World grain consumption is growing by 1.4 million tons a year faster than world grain production.

During the 1960's, the world food problem was perceived as a food/population problem centered on the developing countries, a race between food and people. During the 1970's, rapid global population growth continues to generate demand for more food, but, in addition, rising affluence is emerging as a major new claimant on the world's food resources. Population growth will require doubling food production in about a generation just to maintain current levels, but rising affluence places even greater demands on cereals. In poor countries, the per capita consumption of grain is about 400 pounds per year, most of it consumed directly. In rich countries like Canada and the US, the per capita consumption is nearly a ton, of which only about 150 pounds are consumed directly in baked goods and cereals and the remainder indirectly in the form of livestock and dairy products. The annual per capita consumption of beef in the US rose from 55 pounds in 1940 to 117 pounds in 1972. The per capita consumption of beef, pork, and poultry in the US is currently estimated at 238 pounds per year.

"If Americans ate 10% less meat, it would release enough grain to feed 60 million people."

Jean Mayer, Harvard nutritionist

Secretary Butz announced that the population of the world in the year 2000 will be 7 billion. A reporter asks will there be enough food to feed them? If there isn't, says Secretary Butz, there won't be 7 billion.

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A thousand miles north of Adelaide in the center of the great Australian Outback is little dusty Alice Springs. The rainy season has just ended, the worst in a hundred years. Flying over the vast arid Outback, I can see huge shallow lakes, miles across and as much as four or five feet deep. They'll dry up now of course. What if there was a way to collect and store that rain water for irrigation? There is. The Israelis have been experimenting in the Negev with methods rediscovered from biblical days. In the meantime, the Outback has a handful of Walkabout Aboriginals, some of the largest cattle stations in the world (Aussies like their beef too), and a great deal of empty space. The young people in Alice Springs are bored. They want to go to Adelaide. Australia is the same size as the US without Alaska and Hawaii, and two and a half times the size of India, with a population of only 13 million. They are racing like hell to catch up to America, to have bigger and better and more things like us. And they are throwing their resources to the wind, like us.

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1 acre of grass fed to beef = 43 pounds of protein.
1 acre planted with soybeans = 450 pounds of protein.

It takes up to 10 calories of fossil fuel to produce 1 calorie of food.

For a steer in this country to produce 1 pound of beef requires the average consumption over its lifetime of 4-5 pounds of grain. The pound of beef could then provide protein for two persons one day. But the grain that the animal consumed to produce the pound of meat could have fed four persons.

Purdue scientists have calculated that by eating only high-lysine corn plus a vitamin-mineral supplement, an adult could eat adequately on 10¢ a day.

In India, the average cow produces about 600 pounds of milk annually. In the United States, the average cow produces about 10,000 pounds of milk annually.

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Kai Tak Airport is a madhouse. Thousands of people milling about. Every few steps another Oriental in a dark business suit approaches and mumbles something ending in hotel or tailor or Hong Kong lady. Hustlers. In Hong Kong you are either hustler or hustlee. 4.2 million hustlers, 1 million hustlees. Hong Kong is an anthill. Stand anywhere in Kowloon, you are surrounded by people and walls of high buildings, by shop after shop of watches and cameras and calculators and carved ivory and fancy jewelry and funky kimonos and restaurants and clubs, all with huge neon signs two stories high that reach out to the middle of the narrow streets and join those hanging out from the other side. Above are "factories" turning out tailor made clothes overnight. And around the corner, highrise slums, fifteen to a room. The sidewalks are crowded from early morning to late night. People walk fast, dash across streets in mad lurches to escape fast moving traffic. The air is thick with exhaust that hangs over Kowloon and Hong Kong in a huge cloud on even the sunny days. The harbor is the busiest in the world. Sampans, junks, motorboats, barges, tugs, freighters, tankers, liners, warships, anchored and moving, loading and unloading. But across the harbor from Kowloon is Hong Kong Island, a very different place. The buildings are newer and better spaced, the streets and sidewalks less hectic. Climb the steep streets up the mountain. The air gets better, the apartment houses fancier, the people better dressed, the cars are air conditioned Mercedes and Rolls Royce. Top of the heap. The bigtime hustlers. Everybody in Hong Kong works to stay alive. Everybody in Hong Kong is in a hurry. Everybody in Hong Kong wears a watch. In Hong Kong the people say they work an eight day week. They do. 4.2 million people in about 42 square miles. They wear Western clothes and they watch Western television. Mission Impossible and Gunsmoke dubbed in Chinese, The Waltons with Chinese subtitles. Hong Kong wants to be America too.

"The woman is Indian, from Haji Mulang."

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"By the most conservative estimates, at least 460 million people are threatened with starvation today. Ten million will probably die this year, most of them under five."

Newsweek 11-11-74

"We have always had hungry people in the world. I think the situation is tight and it's serious. But it is not a crisis."

Earl Butz, Sec. of Agriculture

The polar icecaps are cooling, it is said, creating draught, early frost, heavy rains, flooding, and a southern shift in the monsoons. World food surplus at this writing is about a twenty-four day supply. By the spring of 1975 it will have dwindled to about an eight day supply. The cost of oil has increased over 400% in a year. There is a world shortage of fertilizer and the developing nations cannot afford to buy what fertilizer is available. With food short, farmers have eaten next year's seed crop. The Sahara Desert is expanding southward at the rate of thirty miles a year. The cost of wheat has more than doubled since the summer of 1973, soybeans have tripled, rice has quadrupled.

"For every million nutrient tons of reduction in fertilizer supply, there will be a corresponding drop in grain production of 10 million tons."

Dr. Norman Borlaug
1970 Nobel Laureate

Shipments of grain under Public Law 480 (Food For Peace), maintained for many years at a level of 6-7 million tons of wheat and wheat products, fell in 1973 to 4.1 million tons, and in 1974 to less than 1.24 million tons. In response to a telegram sent by several US delegates to the World Food Conference and requesting that the President commit an additional million tons, President Ford announced that the US pledge of 3.3 million tons of emergency food aid is the most the country can support without driving up domestic food prices. Title I of PL 480 enables us to send food as "security supporting assistance," Title II covers "humanitarian aid." To Bangladesh in the midst of famine, we have promised $53.5 million worth of food so far this fiscal year under Title II. Under Title I we have contracted to send Indochina $82.4 million worth of food, Egypt $68.1 million, and Chile $17.1 million. Cambodia and South Vietnam received four times the amount received by Sahel and Bangladesh, and most of it was sold on the open market to raise local currency to bolster the Thieu and Lon Nol war efforts. If poor people in Vietnam and Cambodia were hungry, our free food did not feed them. Cambodia with seven million people received five times as much food aid as 75 million Bengalis.

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Bombay is hot. The monsoons will be here soon. The road freaks have all left for Goa or Katmandu or Kabul. They won't be missed, except at the hippie hotel where I'm staying for twenty-five rupees a day. There are six million people in Bombay. A million and a half of them live on the street. Born on the street, live on the street, die on the street. No cows here, just people. All the way in from the airport last night, there were huddled forms sleeping on both sides of the road. It rained, there was no cover for them. Up at five-thirty and out walking by six. Dungarees, a work shirt, and a strong pair of Canadian boots. Around the corner is the Taj Majhal Hotel, the most luxurious in this part of the world. Across the street, the famous India Gate with forty or fifty beggars still asleep nearby. No need for them to wake this early, the tourists haven't had breakfast yet. There was a big storm last night, many small boats wrecked in the bay. The water near India Gate is alive with men in loincloths hired by the Bombay Yacht Club to retrieve the water-filled dinghies and small sailboats that sank during the night. Later when the tide is out, scavengers will crawl over the rocks looking for pieces of sailcloth. A piece of sailcloth, any cloth in fact, is very important in Bombay. You can sleep on it or under it or wear it or wash with it or carry things wrapped in it, there is no end of things you can do in Bombay with a piece of cloth. Back home we would call it a rag.

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The US wastes more food than any other country in the world. The major nutritional disorders in the US are those of excess — obesity, diabetes, high blood pressure, cardiac disease.

Forty percent of the population of India is under twenty years old, eighty percent of those suffer from malnutrition.

Despite ten years of fairly vigorous family planning, $80 million was spent in 1974, by the time the average Indian woman reaches 46 she will have had 5.6 children.

Nutritionists say an average Indian adult consumes 170 kilos of grain a year, a Southeast Asian 182, a Chinese 200, an American 1000. When an Indian laborer with a family of eight has to feed them on 70 ounces a day, it is slow starvation.

India is the world's seventh largest industrial power.

The Punjab Plain was the main setting in India for the Green Revolution in 1967. Acre for acre they produced the highest wheat yields on earth. But it took a lot of money. Fertilizer consumption rose from 300,000 tons in 1961 to 3.1 million tons (present estimated demand: 5 million tons), electric and diesel pumps from 420,000 to 2.1 million, tubewells from 19,000 to 718,000, tractors from 31,000 to 173,000. But the number of acres planted in the new high-yielding varieties rose from 2 to 23 million hectacres. Then came draught, a shortage of oil, a shortage of fertilizer, inflation, quadrupled costs. US aid to India which peaked in 1966 at $877 million and 236 skilled professionals mostly involved in agriculture, is down now to a $50 million a year infant and pregnant mother feeding program and nine Americans, mostly administrators. The Rockefeller Foundation pulled out two years ago. The Ford Foundation is down to a skeleton crew of non-technicians.

Total water withdrawal in the US is 1,270 gallons of water per person per day. To grow one pound of wheat requires about 1,500 pounds of water. To produce one pound of bread requires about 2,500 pounds of water. To produce one pound of beef for the table, between 100-500 tons of water are either involved or associated.

". . . the Aussie Outback, nobody there but walkabouts and racist cattlemen."

In 1973 the average American spent 16% of total income on food. The average Indian spent 80%.

Walking along Marine Drive now. Two miles of backbay on the left, expensive apartment on the right. At the end is Malibar Hill with the Hanging Gardens and the Tower of Silence where the Parsis put their dead out for the birds to eat. Cutting back to the inner city, through crowded streets of noise and confusion. The air is thick with the afternoon heat. People walk three and four abreast down the narrow streets, edging over to the side at the last minute to avoid the horn-blowing traffic behind them. It is a steady flow of people, cars, trucks, and carts, all intermingled. The sidewalks are cluttered with people too, many lying down. Some are still asleep. Others are dying. It is a smell unlike any other, the smell of starvation, if you smell it once it will be with you forever. There are beggars everywhere. They are very polite. Some barefoot children have been running at my side, watching anxiously for a sign of recognition. I stop to give them a coin. They do a shuffle to keep from burning their little feet on the hot sidewalk. Then they are gone. An older boy races by with a clap of his hands and a hoopla!, does two cartwheels, and returns with a shy smile and an outstretched palm. A young mother with a baby in her arms (always the little baby) and three or four more at her side murmers please sahib and holds out a hand. A cripple taps my leg from below. Old people curled in fetal position stare at me from the shade, too weak to even ask. So many, so many. My god, it is impossible to bear.

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A BTU is the amount of energy required to raise one pound of water one degree fahrenheit.

One 42-gallon barrel of oil = 5.8 million BTUs
One cubic foot of natural gas = 1,031 BTUs
One kilowatt hour of electricity = 3,413 BTUs
One ton of coal = 25 million BTUs

During the 1960's, US population increased 11%, households increased 17%, residential energy use increased 50%. Almost all American homes now contain five basic energy-consuming items: central heat, hot water heater, stove, refrigerator, and electric lights. Virtually all have one radio and one television set. Seven out of ten have washing machines. Central air conditioning has grown from 5% of American households in 1969 to 15% in 1973, dishwashers from 6% to 25%. Almost half the homes have clothes dryers. Most refrigerators on the market today are large, frost-free models which require two-thirds more energy than the smaller manual defrosting models. Eight out of ten American households now own at least one car, three in ten have two cars, one in ten has three cars. There has been a 4.3% annual growth in transportation energy since 1960. Automobiles consumed an average of 8,100 BTUs per passenger mile of urban travel in 1970. The US has 6% of the world's population and uses one-third of the world's energy. And most of the world wants to live like America.

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"Office buildings on Hong Kong Island . . . 4.2 million people in about 43 square miles . . . here in Appleton, 730 people in the exact same space."

Nobody else seems to pay much attention to the beggars. Now and then an Indian businessman gives one a coin. Occasionally a tourist will give money, or more often look away. The beggars of Bombay, of Calcutta, of Delhi, are an accepted fact. That they are dying or multiplying seems also to be accepted. People I talk to often seem annoyed that that is most pressing on my mind. The poorer you are, the more children you will need to care for you in old age, because the poorer you are, the higher the infant mortality rate. You need to have many so that one or two sons may survive. I am standing near Victoria Station, watching a work crew repairing the street. An old man in shorts and bare feet is standing in a trench and swinging a pick, slowly. It is very hot. The old man is very thin but he seems to be in good health. Yet he is getting older. He makes only enough for himself and his family to get through the day, he has never made enough to save anything. When his body gets weak and he is no longer able to swing the pick, he will no longer be able to work. There is no Social Security. When his body goes, so must he. Unless he has a son or two. The contrast in Bombay is very evident between the rich and the poor, between the fed and the hungry, between the living and the dying, because they are not segregated. With a million and a half living on the street and more arriving from the country each day in search of food, there is nowhere to hide them. They have no television to watch, school is not compulsory and there would be no room for all of them anyway. So here they are, right out in the open, only no one seems to pay them much notice. The caste system in India is very old. It is an accepted fact. And so 600 million Indians live in less than half the space of 13 million Australians. It is an accepted fact. For now. India has an Atom Bomb.

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The twin skyscrapers of the new World Trade Center in New York City uses more electricity each day for heating, cooling, and lighting than is consumed by the entire city of Schenectady with some 80,000 inhabitants.

"There is growing concern in the United States and the world about the wisdom of a commitment to nuclear power . . . . Our analysis on alternative energy scenarios shows that as long as this nation continues on a track of rapid growth in energy, nuclear fission energy will be needed to meet demand. Only under a long term commitment to substantial energy conservation could curtailment of nuclear power growth be taken seriously."

Energy Policy Project of
The Ford Foundation

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That this Act may be cited as the "Solar Energy Research, Development, and Demonstration Act of 1974."

Declaration of Findings and Policy

Sec. 2. (a) The Congress hereby finds that —

(1) the needs of a viable society depend on an ample supply of energy;

(2) the current imbalance between domestic supply and demand for fuels and energy is likely to persist for some time;

(3) dependence on nonrenewable energy resources cannot be continued indefinitely, particularly at current rates of consumption;

(4) it is in the Nation's interest to expedite the long-term development of renewable and nonpolluting energy resources, such as solar energy;

(5) the various solar energy technologies are today at widely differing stages of development, with some already near the stage of commercial application and others still requiring basic research;

(6) the early development and export of viable equipment utilizing solar energy, consistent with the established preeminence of the United States in the field of high technology products, can make a valuable contribution to our balance of trade;

(7) the mass production and use of equipment utilizing solar energy will help to eliminate the dependence of the United States upon foreign energy sources and promote the national defense;

(8) to date, the national effort in research, development, and demonstration activities relating to the utilization of solar energy has been extremely limited; therefore

(9) the urgency of the Nation's critical energy shortages and the need to make clean and renewable energy alternatives commercially viable require that the Nation undertake an intensive research, development, and demonstration program with an estimated Federal investment which may reach or exceed $1,000,000,000.

Sec. 2 (b) The Congress declares that it is the policy of the Federal Government to —

(1) pursue a vigorous and viable program of research and resource assessment of solar energy as a major source of energy for our national needs; and

(2) provide for the development and demonstration of practical means to employ solar energy on a commercial scale.

Authorization of Appropriations

Sec. 17. To carry out the provisions of this Act, there are authorized to be appropriated —

(1) for the fiscal year ending June 30, 1976, $75,000,000;

(2) for subsequent fiscal years, only such sums as the Congress hereafter may authorize by law;

(3) such amounts as may be authorized for the construction of demonstrations pursuant to section 7(f) of this Act; and

(4) to the National Science Foundation for the fiscal year ending June 30, 1975, not to exceed $2,000,000 to be made available for use in the preparation of the comprehensive program definition under section 15.

Approved October 26, 1974.

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That should be enough to give you the general idea. The numbers will continue to change of course as more people are born and others starve to death, as the OPEC nations charge more for oil and we charge more for wheat, but you get the idea. Doom is still hanging around, the tennis match is still on, and they're still counting the number of MacDonald hamburgers sold each week. We wait for technocratic miracles. A button to push, a pill to take, a chemical to spray in the air. The world fish catch is off again? They'll come back, they always do. And the Market will go back up again eventually, like it did before. This can't last forever. We've had problems before and licked them, we can do it again. Good old American know-how. And a WIN button.

But what if it doesn't go away? What if it gets worse? What if the Titanic hits the Iceberg? What if there's no what if?

Lifeboats

1974 was a big year. The Conference on the Law and the Sea in Caracas, the World Population Conference in Budapest, the World Food Conference in Rome. There was much to discuss and to accomplish for the world community. The Conference on the Law and the Sea was to determine who should have access to the vast deposits of marine petroleum and natural gas, minerals, and marine protein; who should pay fees to whom and for what; who should have the responsibility of protecting the marine ecosystem against pollution and exploitation; how much latitude should coastal states be permitted in setting territorial conditions? All very critical questions, but not too difficult for a cooperative effort among nations of the world.

At the same time though, Peru was seizing American fishing boats off her coast and Russian fishing boats were being seized off ours, some countries had already set 200 mile off-shore limits and others were contemplating doing so including several of our Northeastern states, the world fish catch was off again, and off-shore oil drilling was being discussed here as a crisis necessity.

The World Population Conference was dominated by the polemics of Catholic, Communist, and African countries who either considered family planning and birth control to be sacrilegious or the goal of a racist conspiracy, and in either event the device with which rich industrial states would continue to avoid the responsibility of aiding and encouraging the economic progress of the developing countries. The World Food Conference resolved that "within a decade no child will go to bed hungry, that no family will fear for its next day's bread, and that no human being's future and capacities will be stunted by malnutrition."

But during the same conference in which such humanistic goals were being set as Draft Resolution XIV which called for a reduction of military expenditures and the allocation of sums so released to the financing of food production and the establishment of emergency resources, the Soviet Union was objecting that the Provisional Revolutionary Government of South Vietnam had not been invited and Romania objected that Sihanouk's Government had not been invited nor the Democratic People's Republic of Korea and Cuba complained that the Khmer Republic delegation did not represent the Khmer people and China stated that the Lon Nol clique in Cambodia represents nobody but themselves and the representatives of Albania, Egypt, Madagascar, Peru, Iraq, Somalia, Sudan, Yugoslavia, Yemen, Guinea, Poland, Algeria, Togo, and Morocco associated themselves with the previous speakers and Israel objected to the presence of the Palestine Liberation Organization because it was not a true movement of national liberation but an organization of terrorist groups and the PLO said that in the past all national liberation and resistance movements had at one time or another been labeled terrorist groups by colonialist and occupying forces.

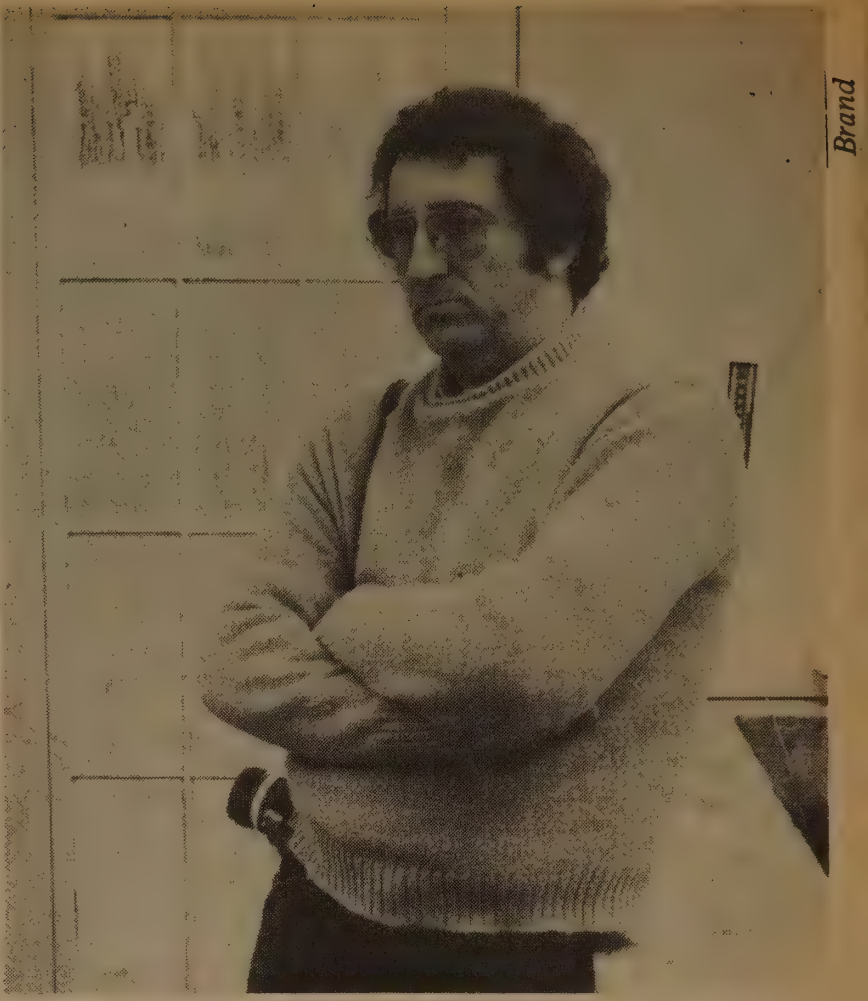
And the minister of food from Bangladesh walked out on the conference saying that all this talk wasn't feeding his starving people and he was going home to do what little he could there, rather than waste his time with politics in Rome.

An alignment of Third World and Communist countries now controls the United Nations General Assembly. The OPEC countries control the bulk of the world oil supply of all non-oil producing countries, have cut back production and raised prices. Other oligarchic cartels, following the example of OPEC, are forming among developing countries in an attempt to manipulate supplies and prices of sugar, coffee, copper, zinc, and other raw materials needed by the developed countries. The United States, the largest exporter of food products in the world and controlling a greater percentage of world food supplies than OPEC does oil, threatens export restraints in retaliation. It is what Roger Hansen, senior fellow of the Overseas Development Council, calls "The Politics of Scarcity."

It's all very complicated, the geo-politics of starvation, and I begin to agree with the minister from Bangladesh: you can't eat hot air. Polemics won't fill an empty belly, resolutions won't heat a house, nationalism won't guarantee electricity. While the countries of the world play their little power games, we hold hands with Doom. I don't like it. The ship, I discover, is not unsinkable and the realization is startling. But not overwhelming. Each of us can do something about it.

We can refuse to go down with the ship.

We will need energy, and food, and space. We will need to know how to get them and how to use them. We will need lifeboats.


Brand

My at the New Alchemy Institute, Woods Hole, Massachusetts.

[Here follows the body of the book — five of My's heart-interviews with five builders of lifeboats. They are:

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ILS Labs
Star Route 103
Tijeras, New Mexico 87059

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And so . . .

maybe we don't need lifeboats.

Maybe we can swim on our own. It must have been done before, there must have been people in other civilizations that knew how to swim. Not everybody went down the chute or we wouldn't be here now. Survival of the fittest, it's the law of nature. We could make a pretty good case for triage, like Jay Forrester did from MIT. It's a comfortable position when it's we who are the fittest, wouldn't you agree? We might not have to swim after all.

Or maybe you've spotted the flaw in the metaphor. Odds are there's only one way the Titanic would sink completely and after that happens it might not even be worth hanging around. Otherwise, it will probably only keel over on its side or turn bottom up. In which case all we have to do is be strong enough to hang on. We might not have to swim after all.

Or maybe by now everything is so completely out of control as a result of man's inept stewardship that the environment is simply in the process of dumping our system before our system can dump the environment and that what we are witnessing as chaos is just a manifestation of that process. In which case we have only to weather the storm and let the environment take care of itself . . . and us. We might not have to swim after all.

Or maybe Christ will be here in a year or so. The other day two very warm and sincere Seventh Day Adventists came to my door to share a message with me and as we sat and talked, they explained with appropriate biblical references that what has been happening in the world was prophesied, that the Day of Judgment is quite near, quite near, that each of us now has the opportunity to choose between God and Satan, that very soon all of the conditions of the prophecy will have been fulfilled and those who have chosen Satan will be destroyed while those who have chosen God will live forever on this earth in Christ's Kingdom. The meek shall inherit about two and a half acres each, I believe. Their message is clear. Their faith is strong. Maybe ours should be. We might not have to swim after all.

Or maybe it doesn't really make any difference. Maybe we're just a transient species on our way from the apes to somewhere else and this is all part of some totally obscure master plan, or no plan at all, either way, what the hell. If we're born to have we have, if we're born to have-not we have-not, and what does it matter anyway here we are jumping up and down for attention and if you get far enough away out there you can't even see the bloody planet this whole sad business is just an eye blink in the history of the universe or is it universes I forget what it was the astrophysicists finally decided. So we swim or we drown, it's all the same. We might not have to swim after all.

Maybe.

Maybe, maybe, maybe.

I don't like maybe.

Maybe is too imprecise. Maybe means that I don't have much to say in what happens to me. I don't like that. So I've made my decision. I intend to survive. And in order for me to survive I must also help you to survive, because if you go down you might drag me with you. Hand to hand, we're all connected. Past, present, and future, hand to hand as well. What you could call the Three Dimensional Domino Theory. The worse things have been getting, the more three dimensional I feel. I've decided that I don't want somebody in the future to think about me the way I have been thinking about the fools that preceded me, and I want no responsibility for that somebody in the future having a lower quality of life because of me, or no quality at all. And that goes for present somebodys too, I want to sleep nights.

And so . . . I have shared these lifeboats with you — there are others of course, you need only look for them — out of my own selfish interests, and I leave you with this final warning: it's not going to be easy. If you're all fired up now and you feel it in your gut and you're ready to do something about it besides talk a good game, I just want you to understand that it is harder to do than to say. There are many, many layers of conditioning to de-condition. I know. I have found it out already in my own house.

The reason that so much of the world is hungry is because it cannot support our level of affluence. The reason that the world is running out of resources is because we've been squandering them. The reason that the world suffers inflation is because we let need become want and want become must have. The reason that our well has begun to run dry is because we drank too often and too deep and too long. But my kids don't understand any of that and they don't want to.

They don't understand why I tell them to eat from the neck down and not from the neck up, to eat what their bodies need and not what their eyes want, to use food for nourishment and not for pleasure. They don't understand why I tell them to watch television only when it's good and not when there's nothing else to do. They don't understand why I tell them to think about what they want in the refrigerator before they open it, not after, to take three things out once, not one thing three times. They don't want to dress warmly in the house, they want the heat turned up. They leave the lights on in a room that they've left because they're coming back to it soon. Or the television or the radio or the stereo. Or the Super Max, thanks a lot Gillette.

So I keep after them and I'm a policeman, I'm a Calvinist, I'm a year 'round Scrooge. I have finally figured out what a kilowatt hour is, what it really is, and I'm running around now like a madman with a notebook and a stopwatch timing people's showers and things like that because the number of kwh's we have been using is insupportable, absolutely insupportable, and they all think I'm crazy. Elaine says it's like living in the house with Martin Luther.

One day one of the girls stood looking into the refrigerator for five minutes trying to decide on an after-school snack, couldn't, and shut the door empty handed. After all my discussions! All right, lectures. Well it was too much. So I got a blue ribbon and I tied the doors of our side-by-side-refrigerator-freezer-frost-free-of-course together with a big bow. What's that for, they said? That is a reminder so that each of us will think about what we want before we open the refrigerator because it will be a pain in the ass to keep untying and tying the bow for nothing, I announced. And they laughed. And they got this very distant look in their eyes when they realized that I was serious. And in the morning the ribbon was gone.

That is why I say it's not going to be easy.

So I have decided to take what Murray Bowen who is one of the fathers of Family Therapy calls the I-Position which is to accept responsibility for my own actions. I am a vegetarian. I am growing as much of my own food as I can and learning to put food by as they say in the country. I eat only until I am no longer hungry and only what I need not what I want. I will insist on performance from those whose goods and services I buy or pay taxes to support. I will read up on nutrition and soil and water and sun and wind and electricity and chemical toilets, and I will try to use what I learn, constructively. I will use fewer "things" and less nonreplenishable resources. I will walk when I do not have to ride. And still the quality of my life will be on an order of magnitude greater than over half the world. But theirs can improve if mine is reduced. Those who survive.

I've made up my mind. I will have a say in what happens to me. So can you, but it won't be easy. They may call you a Calvinist too.

I began this search thinking that lifeboats are hardware. They're not. We won't need hardware when the ship goes down, we will need new values. The old ones didn't work. ■

LIVING ON A LIFEBOAT

BY GARRETT HARDIN

Susanne Langer (1942) has shown that it is probably impossible to approach an unsolved problem save through the door of a metaphor. Later, attempting to meet the demands of rigor, we may achieve some success in cleansing theory of metaphor, though our success is limited if we are unable to avoid using common language, which is shot through and through with fossil metaphors. (I count no less than five in the preceding two sentences.)

Since metaphorical thinking is inescapable it is pointless merely to weep about our human limitations. We must learn to live with them, to understand them, and to control them. "All of us," said George Eliot in **Middlemarch**, "get our thoughts entangled in metaphors, and act fatally on the strength of them." To avoid unconscious suicide we are well advised to pit one metaphor against another. From the interplay of competitive metaphors, thoroughly developed, we may come closer to metaphor-free solutions to our problems.

Most of the haters of Garrett Hardin's "Lifeboat Ethics" — liberals have gone blood-mad over it this winter — have not read the original article. Here it is, reprinted from the October '74 BioScience *($18/yr from 3900 Wisconsin Ave., Washington, DC 20016).*

*Hardin is a formal, readable scientist specializing in taboo topics. He is no friend to the Establishment. In the past he has changed minds and policy on birth control and abortion (pro), on the blinking of competition in ecology (*Nature and Man's Fate *— CATALOG p. 30), and on the "tragedy of the commons" — the cybernetic root of what Kesey has called "the commune lie". Hardin has also blasted my beloved NASA.*

I'm with him on this one. When food, medicine, weapons, or technology move unilaterally — in one direction — across language boundaries, cultural destruction results. It is the same kind of well-intentioned mischief as killing predators or stopping forest fires.

We need a term for inter-cultural iatrogenic disease — disease caused by (over-specialized) treatment. If the world becomes an enormous hospital, we've had it.

— SB

No generation has viewed the problem of the survival of the human species as seriously as we have. Inevitably, we have entered this world of concern through the door of metaphor. Environmentalists have emphasized the image of the earth as a spaceship — Spaceship Earth. Kenneth Boulding (1966) is the principal architect of this metaphor. It is time, he says, that we replace the wasteful "cowboy economy" of the past with the frugal "spaceship economy" required for continued survival in the limited world we now see ours to be. The metaphor is notably useful in justifying pollution control measures.

Unfortunately, the image of a spaceship is also used to promote measures that are suicidal. One of these is a generous immigration policy, which is only a particular instance of a class of policies that are in error because they lead to the tragedy of the commons (Hardin 1968). These suicidal policies are attractive because they mesh with what we unthinkingly take to be the ideals of "the best people." What is missing in the idealistic view is an insistence that rights and responsibilities must go together. The "generous" attitude of all too many people results in asserting inalienable rights while ignoring or denying matching responsibilities.

For the metaphor of a spaceship to be correct the aggregate of people on board would have to be under unitary sovereign control (Ophuls 1974). A true ship always has a captain. It is conceivable that a ship could be run by a committee. But it could not possibly survive if its course were determined by bickering tribes that claimed rights without responsibilities.

What about Spaceship Earth? It certainly has no captain, and no executive committee. The United Nations is a toothless tiger, because the signatories of its charter wanted it that way. The spaceship metaphor is used only to justify spaceship demands on common resources without acknowledging corresponding spaceship responsibilities.

An understandable fear of decisive action leads people to embrace "incrementalism" — moving toward reform by tiny

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stages. As we shall see, this strategy is counterproductive in the area discussed here if it means accepting rights before responsibilities. Where human survival is at stake, the acceptance of responsibilities is a precondition to the acceptance of rights, if the two cannot be introduced simultaneously.

Lifeboat Ethics

Before taking up certain substantive issues let us look at an alternative metaphor, that of a lifeboat. In developing some relevant examples the following numerical values are assumed. Approximately two-thirds of the world is desperately poor, and only one-third is comparatively rich. The people in poor countries have an average per capita GNP (Gross National Product) of about $200 per year; the rich, of about $3,000. (For the United States it is nearly $5,000 per year.) Metaphorically, each rich nation amounts to a lifeboat full of comparatively rich people. The poor of the world are in other, much more crowded lifeboats. Continuously, so to speak, the poor fall out of their lifeboats and swim for a while in the water outside, hoping to be admitted to a rich lifeboat, or in some other way to benefit from the "goodies" on board. What should the passengers on a rich lifeboat do? This is the central problem of "the ethics of a lifeboat."

First we must acknowledge that each lifeboat is effectively limited in capacity. The land of every nation has a limited carrying capacity. The exact limit is a matter for argument, but the energy crunch is convincing more people every day that we have already exceeded the carrying capacity of the land. We have been living on "capital" — stored petroleum and coal — and soon we must live on income alone.

Let us look at only one lifeboat — ours. The ethical problem is the same for all, and is as follows. Here we sit, say 50 people in a lifeboat. To be generous, let us assume our boat has a capacity of 10 more, making 60. (This, however, is to violate the engineering principle of the "safety factor." A new plant disease or a bad change in the weather may decimate our population if we don't preserve some excess capacity as a safety factor.)

The 50 of us in the lifeboat see 100 others swimming in the water outside, asking for admission to the boat, or for handouts. How shall we respond to their calls? There are several possibilities.

ONE. We may be tempted to try to live by the Christian ideal of being "our brother's keeper," or by the Marxian ideal (Marx 1875) of "from each according to his abilities, to each according to his needs." Since the needs of all are the same, we take all the needy into our boat, making a total of 150 in a boat with a capacity of 60. The boat is swamped, and everyone drowns. Complete justice, complete catastrophe.

TWO. Since the boat has an unused excess capacity of 10, we admit just 10 more to it. This has the disadvantage of getting rid of the safety factor, for which action we will sooner or later pay dearly. Moreover, which 10 do we let in? The neediest 10? How do we discriminate? And what do we say to the 90 who are excluded?

THREE. Admit no more to the boat and preserve the small safety factor. Survival of the people in the lifeboat is then possible (though we shall have to be on our guard against boarding parties).

The last solution is abhorrent to many people. It is unjust, they say. Let us grant that it is.

"I feel guilty about my good luck," say some. The reply to this is simple: Get out and yield your place to others. Such a selfless action might satisfy the conscience of those who are addicted to guilt but it would not change the ethics of the lifeboat. The needy person to whom a guilt-addict yields his

place will not himself feel guilty about his sudden good luck. (If he did he would not climb aboard.) The net result of conscience-stricken people relinquishing their unjustly held positions is the elimination of their kind of conscience from the lifeboat. The lifeboat, as it were, purifies itself of guilt. The ethics of the lifeboat persist, unchanged by such momentary aberrations.

This then is the basic metaphor within which we must work out our solutions. Let us enrich the image step by step with substantive additions from the real world.

Reproduction

The harsh characteristics of lifeboat ethics are heightened by reproduction, particularly by reproductive differences. The people inside the lifeboats of the wealthy nations are doubling in numbers every 87 years; those outside are doubling every 35 years, on the average. And the relative difference in prosperity is becoming greater.

Let us, for a while, think primarily of the U.S. lifeboat. As of 1973 the United States had a population of 210 million people, who were increasing by 0.8% per year, that is, doubling in number every 87 years.

Although the citizens of rich nations are outnumbered two to one by the poor, let us imagine an equal number of poor people outside our lifeboat — a mere 210 million poor people reproducing at a quite different rate. If we imagine these to be the combined populations of Colombia, Venezuela, Ecuador, Morocco, Thailand, Pakistan, and the Philippines, the average rate of increase of the people "outside" is 3.3% per year. The doubling time of this population is 21 years.

Suppose that all these countries, and the United States, agreed to live by the Marxian ideal, "to each according to his needs," the ideal of most Christians as well. Needs, of course, are determined by population size, which is affected by reproduction. Every nation regards its rate of reproduction as a sovereign right. If our lifeboat were big enough in the beginning it might be possible to live for a while by Christian-Marxian ideals. Might.

Initially, in the model given, the ratio of non-Americans to Americans would be one to one. But consider what the ratio would be 87 years later. By this time Americans would have doubled to a population of 420 million. The other group (doubling every 21 years) would now have swollen to 3,540 million. Each American would have more than eight people to share with. How could the lifeboat possibly keep afloat?

All this involves extrapolation of current trends into the future, and is consequently suspect. Trends may change. Granted: but the change will not necessarily be favorable. If — as seems likely — the rate of population increase falls faster in the ethnic group presently inside the lifeboat than it does among those now outside, the future will turn out to be even worse than mathematics predicts, and sharing will be even more suicidal.

Ruin in the Commons

The fundamental error of the sharing ethics is that it leads to the tragedy of the commons. Under a system of private property the man (or group of men) who own property recognize their responsibility to care for it, for if they don't they will eventually suffer. A farmer, for instance, if he is intelligent, will allow no more cattle in a pasture than its carrying capacity justifies. If he overloads the pasture, weeds take over, erosion sets in, and the owner loses in the long run.

But if a pasture is run as a commons open to all, the right of each to use it is not matched by an operational responsibility to take care of it. It is no use asking independent herdsmen in a commons to act responsibly, for they dare not. The considerate herdsman who refrains from overloading the commons suffers more than a selfish one who says his needs are greater. (As Leo Durocher says, "Nice guys finish last.") Christian-Marxian idealism is counterproductive. That it sounds nice is no excuse. With distribution systems, as with individual morality, good intentions are no substitute for good performance.

A social system is stable only if it is insensitive to errors. To the Christian-Marxian idealist a selfish person is a sort of "error." Prosperity in the system of the commons cannot survive errors. If everyone would only restrain himself, all would be well; but it takes only one less than everyone to ruin a system of voluntary restraint. In a crowded world of less than perfect human beings — and we will never know any other — mutual ruin is inevitable in the commons. This is the core of the tragedy of the commons.

One of the major tasks of education today is to create such an awareness of the dangers of the commons that people will be able to recognize its many varieties, however disguised. There is pollution of the air and water because these media are treated as commons. Further growth of population and growth in the per capita conversion of natural resources into pollutants require that the system of the commons be modified or abandoned in the disposal of "externalities."

The fish populations of the oceans are exploited as commons, and ruin lies ahead. No technological invention can prevent this fate: in fact, all improvements in the art of fishing merely hasten the day of complete ruin. Only the replacement of the system of the commons with a responsible system can save oceanic fisheries.

The management of western range lands, though nominally rational, is in fact (under the steady pressure of cattle ranchers) often merely a government-sanctioned system of the commons, drifting toward ultimate ruin for both the rangelands and the residual enterprisers.

World Food Banks

In the international arena we have recently heard a proposal to create a new commons, namely an international depository of food reserves to which nations will contribute according to their abilities, and from which nations may draw according to their needs. Nobel laureate Norman Borlaug has lent the prestige of his name to this proposal.

A world food bank appeals powerfully to our humanitarian impulses. We remember John Donne's celebrated line, "Any man's death diminishes me." But before we rush out to see for whom the bell tolls let us recognize where the greatest political push for international granaries comes from, lest we be disillusioned later. Our experience with Public Law 480 clearly reveals the answer. This was the law that moved billions of dollars worth of U.S. grain to food-short, population-long countries during the past two decades. When P.L. 480 first came into being, a headline in the business magazine **Forbes** (Paddock and Paddock 1970) revealed the power behind it: "Feeding the World's Hungry Millions: How it will mean billions for U.S. business."

And indeed it did. In the years 1960 to 1970 a total of $7.9 billion was spent on the "Food for Peace" program, as P.L. 480 was called. During the years 1948 to 1970 an additional $49.9 billion were extracted from American taxpayers to pay for other economic aid programs, some of which went for food and food-producing machinery. (This figure does not include military aid.) That P.L. 480 was a give-away program was concealed. Recipient countries went through the motions of paying for P.L. 480 food — with IOU's. In December 1973 the charade was brought to an end as far as India was concerned when the United States "forgave" India's $3.2 billion debt (Anonymous 1974). Public announcement of the cancellation of the debt was delayed for two months: one wonders why.

Famine — 1974! (Paddock and Paddock 1970) is one of the few publications that points out the commercial roots of this humanitarian attempt. Though all U.S. taxpayers lost by P.L. 480, special interest groups gained handsomely. Farmers benefited because they were not asked to contribute the grain — it was bought from them by the taxpayers. Besides the direct benefit there was the indirect effect of increasing demand and thus raising prices of farm products generally. The manufacturers of farm machinery, fertilizers, and pesticides benefited by the farmers' extra efforts to grow more food. Grain elevators profited from storing the grain for varying lengths of time. Railroads made money hauling it to port, and shipping lines by carrying it overseas. Moreover, once the machinery for P.L. 480 was established an immense bureaucracy had a vested interest in its continuance regardless of its merits.

Very little was ever heard of these selfish interests when P.L. 480 was defended in public. The emphasis was always on its humanitarian effects. The combination of multiple and relatively silent selfish interests with highly vocal humanitarian apologists constitutes a powerful lobby for extracting money from taxpayers. Foreign aid has become a habit that can apparently survive in the absence of any known justification. A news commentator in a weekly magazine (Lansner 1974), after exhaustively going over all the conventional arguments for foreign aid — self-interest, social justice, political advantage, and charity — and concluding that none of the known arguments really held water, concluded: "So the search continues for some logically compelling reasons for giving aid . . ." In other words. Act now, Justify later — if ever. (Apparently a quarter of a century is too short a time to find the justification for expending several billion dollars yearly.)

The search for a rational justification can be short-circuited by interjecting the word "emergency." Borlaug uses this word. We need to look sharply at it. What is an "emergency?" It is surely something like an accident, which is correctly defined as an event that is certain to happen, though with a low frequency (Hardin 1972a). A well-run organization prepares for everything that is certain, including accidents and emergencies. It budgets for them. It saves for them. It expects them — and mature decision-makers do not waste time complaining about accidents when they occur.

What happens if some organizations budget for emergencies and others do not? If each organization is solely responsible for its own well-being, poorly managed ones will suffer. But they should be able to learn from experience. They have a chance to mend their ways and learn to budget for infrequent but certain emergencies. The weather, for instance, always varies and periodic crop failures are certain. A wise and competent government saves out of the production of the good years in anticipation of bad years that are sure to come. This is not a new idea. The Bible tells us that Joseph taught this policy to Pharaoh in Egypt more than 2,000 years ago. Yet it is literally true that the vast majority of the governments of the world today have no such policy. They lack either the wisdom or the competence, or both. Far more difficult than the transfer of wealth from one country to another is the transfer of wisdom between sovereign powers or between generations.

"But it isn't their fault! How can we blame the poor people who are caught in an emergency? Why must we punish them?" The concepts of blame and punishment are irrelevant. The question is, what are the operational consequences of establishing a world food bank? If it is open to every country every time a need develops, slovenly rulers will not be motivated to take Joseph's advice. Why should they? Others will bail them out whenever they are in trouble.

Some countries will make deposits in the world food bank and others will withdraw from it: there will be almost no overlap. Calling such a depository-transfer unit a "bank" is stretching the metaphor of bank beyond its elastic limits. The proposers, of course, never call attention to the metaphorical nature of the word they use.

The Ratchet Effect

An "international food bank" is really, then, not a true bank but a disguised one-way transfer device for moving wealth from rich countries to poor. In the absence of such a bank, in a world inhabited by individually responsible sovereign nations, the population of each nation would repeatedly go through a cycle of the sort shown in Figure 1. P_2 is greater than P_1, either in absolute numbers or because a deterioration of the food supply has removed the safety factor and produced a dangerously low ratio of resources to population. P_2 may be said to represent a state of overpopulation, which becomes obvious upon the appearance of an "accident," e.g., a crop failure. If the "emergency" is not met by outside help, the population drops back to the "normal" level — the "carrying capacity" of the environment — or even below. In the absence of population control by a sovereign, sooner or later the population grows to P_2 again and the cycle repeats. The long-term population curve (Hardin 1966) is an irregularly fluctuating one, equilibrating more or less about the carrying capacity.

A demographic cycle of this sort obviously involves great suffering in the restrictive phase, but such a cycle is normal to any independent country with inadequate population control. The third century theologian Tertullian (Hardin 1969a) expressed what must have been the recognition of many wise men when he wrote: "The scourges of pestilence, famine, wars, and earthquakes have come to be regarded as a blessing to overcrowded nations, since they serve to prune away the luxuriant growth of the human race."

Only under a strong and farsighted sovereign — which theoretically could be the people themselves, democratically organized — can a population equilibrate at some set point below the carrying capacity, thus avoiding the pains normally caused by periodic and unavoidable disasters. For this happy state to be achieved it is necessary that those in power be able to contemplate with equanimity the "waste" of surplus food in times of bountiful harvests. It is essential that those in power resist the temptation to convert extra food into extra babies. On the public relations level it is necessary that the phrase "surplus food" be replaced by "safety factor."

But wise sovereigns seem not to exist in the poor world today. The most anguishing problems are created by poor countries that are governed by rulers insufficiently wise and powerful. If such countries can draw on a world food bank in times of "emergency," the population cycle of Figure 1 will be replaced by the population escalator of Figure 2. The input of food from a food bank acts as the pawl of a ratchet, preventing the population from retracting its steps to a lower level. Reproduction pushes the population upward, inputs from the world bank prevent its moving downward. Population size escalates, as does the absolute magnitude of "accidents" and "emergencies." The process is brought to an end only by the total collapse of the whole system, producing a catastrophe of scarcely imaginable proportions.

Such are the implications of the well-meant sharing of food in a world of irresponsible reproduction.

I think we need a new word for systems like this. The adjective "melioristic" is applied to systems that produce continual improvement; the English word is derived from the Latin *meliorare*, to become or make better. Parallel with this it would be useful to bring in the word *pejoristic* (from the Latin *pejorare*, to become or make worse). This word can be applied to those systems which, by their very nature, can be relied upon to make matters worse. A world food bank coupled with sovereign state irresponsibility in reproduction is an example of a pejoristic system.

This pejoristic system creates an unacknowledged commons. People have more motivation to draw from than to add to the common store. The license to make such withdrawals diminishes whatever motivation poor countries might otherwise have to control their populations. Under the guidance of this ratchet, wealth can be steadily moved in one direction only, from the slowly-breeding rich to the rapidly-breeding poor, the process finally coming to a halt only when all countries are equally and miserably poor.

All this is terribly obvious once we are acutely aware of the pervasiveness and danger of the commons. But many people still lack this awareness and the euphoria of the "benign demographic transition" (Hardin 1973) interferes with the realistic appraisal of pejoristic mechanisms. As concerns public policy, the deductions drawn from the benign demographic transition are these:

1) If the per capita GNP rises the birth rate will fall; hence, the rate of population increase will fall, ultimately producing ZPG (Zero Population Growth).

2) The long-term trend all over the world (including the poor countries) is of a rising per capita GNP (for which no limit is seen).

3) Therefore, all political interference in population matters is unnecessary; all we need to do is foster economic "development" — note the metaphor — and population problems will solve themselves.

[more →]

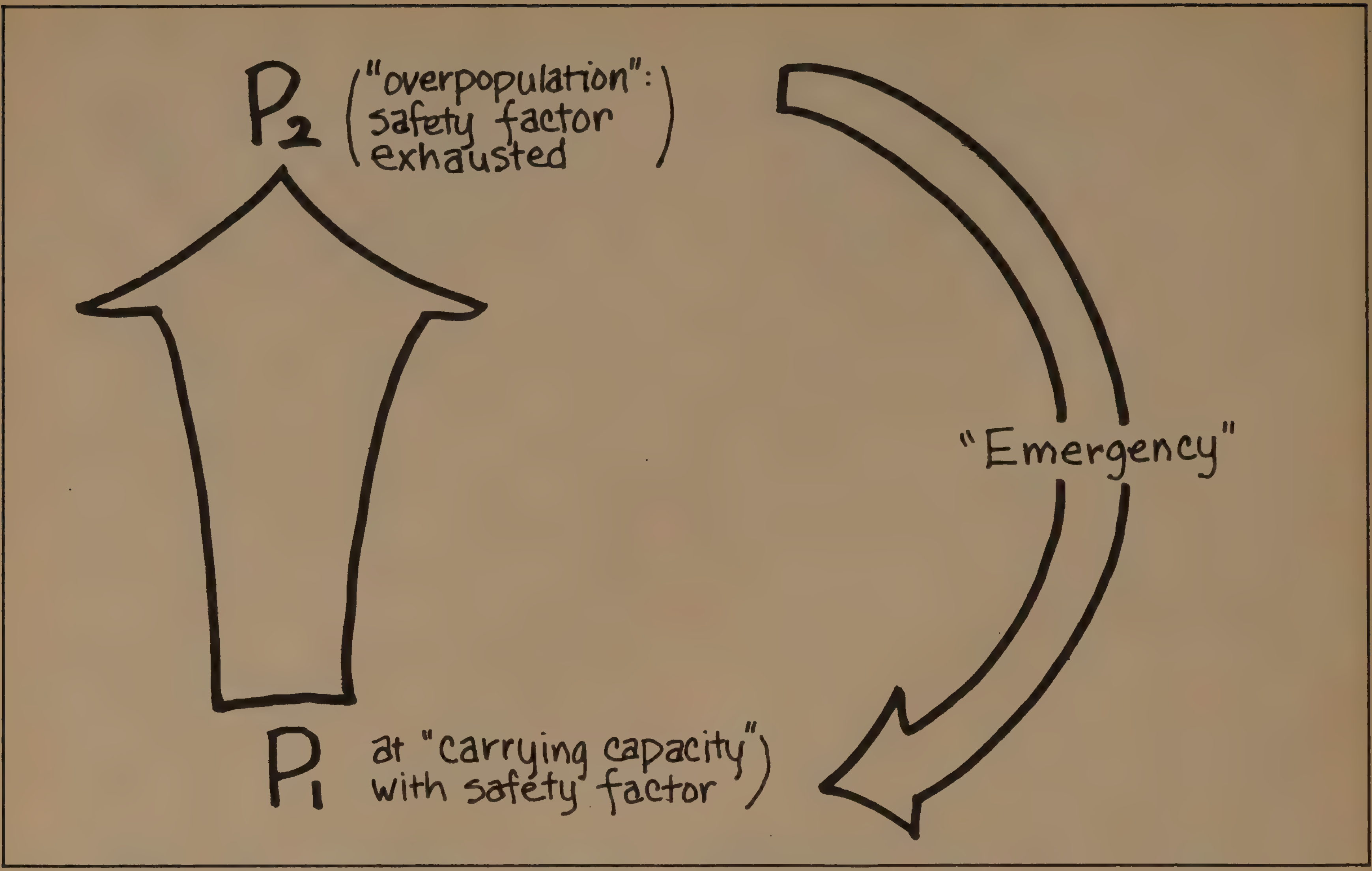
P2 ("overpopulation": safety factor exhausted)
"Emergency"
P1 at "carrying capacity" with safety factor)

Fig. 1. The population cycle of a nation that has no effective, conscious population control, and which receives no aid from the outside. P_2 is greater than P_1.

Those who believe in the benign demographic transition dismiss the pejoristic mechanism of Figure 2 in the belief that each input of food from the world outside fosters development within a poor country thus resulting in a drop in the rate of population increase. Foreign aid has proceeded on this assumption for more than two decades. Unfortunately it has produced no indubitable instance of the asserted effect. It has, however, produced a library of excuses. The air is filled with plaintive calls for more massive foreign aid appropriations so that the hypothetical melioristic process can get started.

The doctrine of demographic laissez-faire implicit in the hypothesis of the benign demographic transition is immensely attractive. Unfortunately there is more evidence against the melioristic system than there is for it (Davis 1963). On the historical side there are many counter-examples. The rise in per capita GNP in France and Ireland during the past century has been accompanied by a rise in population growth. In the 20 years following the Second World War the same positive correlation was noted almost everywhere in the world. Never in world history before 1950 did the worldwide population growth reach 1% per annum. Now the average population growth is over 2% and shows no signs of slackening.

On the theoretical side, the denial of the pejoristic scheme of Figure 2 probably springs from the hidden acceptance of the "cowboy economy" that Boulding castigated. Those who recognize the limitations of a spaceship, if they are unable to achieve population control at a safe and comfortable level, accept the necessity of the corrective feedback of the population cycle shown in Figure 1. No one who knew in his bones that he was living on a true spaceship would countenance political support of the population escalator shown in Figure 2.

Eco-Destruction Via the Green Revolution

The demoralizing effect of charity on the recipient has long been known. "Give a man a fish and he will eat for a day: teach him how to fish and he will eat for the rest of his days." So runs an ancient Chinese proverb. Acting on this advice the Rockefeller and Ford Foundations have financed a multipronged program for improving agriculture in the hungry nations. The result, known as the "Green Revolution," has been quite remarkable. "Miracle wheat" and "miracle rice" are splendid technological achievements in the realm of plant genetics.

Whether or not the Green Revolution can increase food production is doubtful (Harris 1972, Paddock 1970, Wilkes 1972), but in any event not particularly important. What is missing in this great and well-meaning humanitarian effort is a firm grasp of fundamentals. Considering the importance of the Rockefeller Foundation in this effort it is ironic that the late Alan Gregg, a much-respected vice-president of the Foundation, strongly expressed his doubts of the wisdom of all attempts to increase food production some two decades ago. (This was before Borlaug's work — supported by Rockefeller — had resulted in the development of "miracle wheat.") Gregg (1955) likened the growth and spreading of humanity over the surface of the earth to the metastasis of cancer in the human body, wryly remarking that "Cancerous growths demand food; but, as far as I know, they have never been cured by getting it."

"Man does not live by bread alone" — the scriptural statement has a rich meaning even in the material realm. Every human being born constitutes a draft on all aspects of the environment — food, air, water, unspoiled scenery, occasional and optional solitude, beaches, contact with wild animals, fishing, hunting — the list is long and incompletely known. Food can, perhaps, be significantly increased: but what about clean beaches, unspoiled forests, and solitude? If we satisfy the need for food in a growing population we necessarily decrease the supply of other goods, and thereby increase the difficulty of equitably allocating scarce goods (Hardin 1969b, 1972b).

The present population of India is 600 million, and it is increasing by 15 million every year. The environmental load

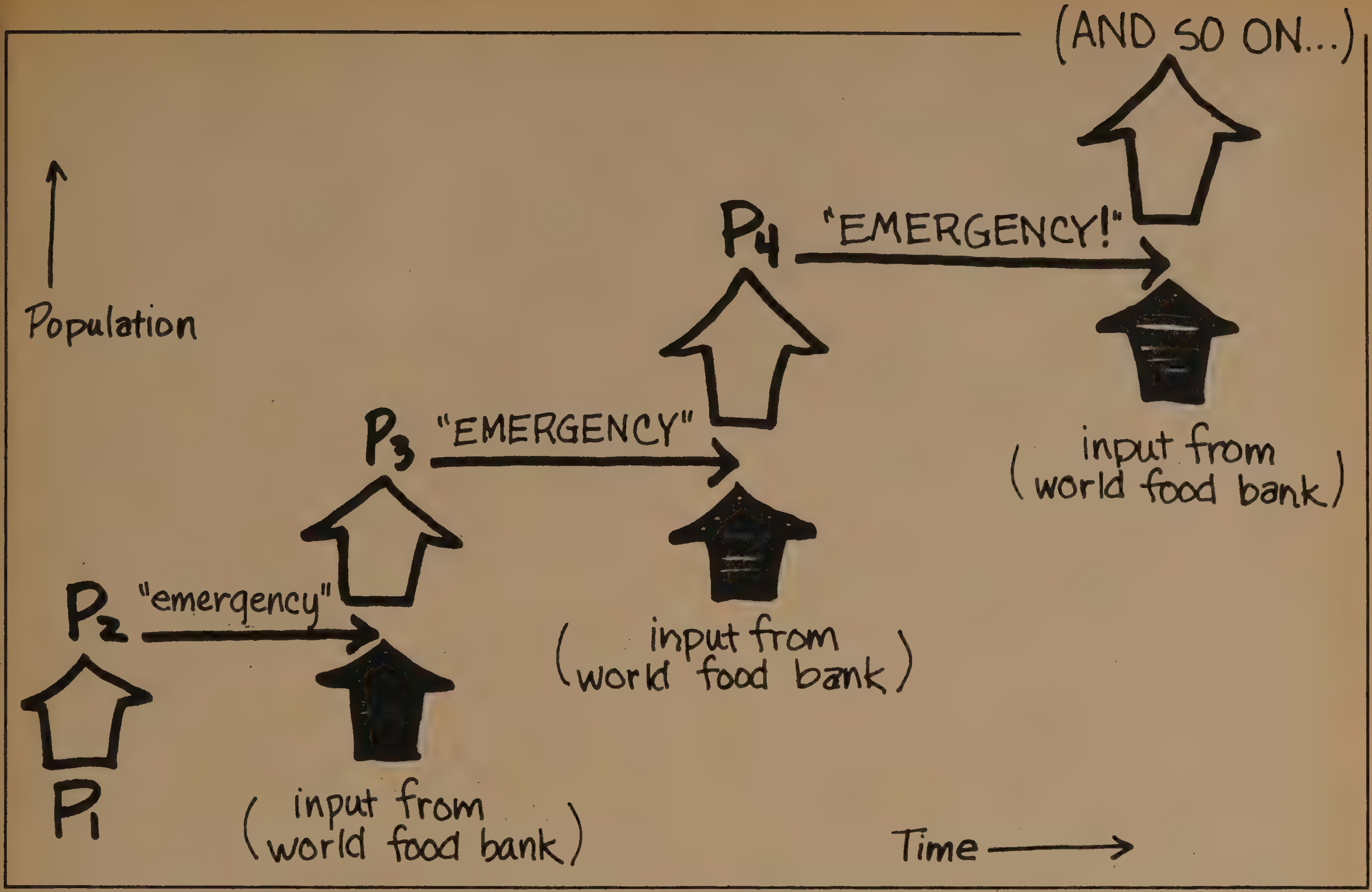
(AND SO ON...)
Population
P_4
"EMERGENCY!"
input from (world food bank)
P_3
"EMERGENCY"
input from (world food bank)
P_2
"emergency"
P_1
input from (world food bank)
Time →

Fig. 2. The population escalator. Note that input from a world food bank acts like the pawl of a ratchet, preventing the normal population cycle shown in Figure 1 from being completed. P_{n+1} is greater than P_n, and the absolute magnitude of the "emergencies" escalates. Ultimately the entire system crashes. The crash is not shown, and few can imagine it.

of this population is already great. The forests of India are only a small fraction of what they were three centuries ago. Soil erosion, floods, and the psychological costs of crowding are serious. Every one of the net 15 million lives added each year stresses the Indian environment more severely. Every life saved this year in a poor country diminishes the quality of life for subsequent generations.

Observant critics have shown how much harm we wealthy nations have already done to poor nations through our well-intentioned but misguided attempts to help them (Paddock and Paddock 1973). Particularly reprehensible is our failure to carry out postaudits of these attempts (Farvar and Milton 1972). Thus have we shielded our tender consciences from knowledge of the harm we have done. Must we Americans continue to fail to monitor the consequences of our external "do-gooding?" If, for instance, we thoughtlessly make it possible for the present 600 million Indians to swell to 1,200 millions by the year 2001 — as their present growth rate promises — will posterity in India thank us for facilitating an even greater destruction of their environment? Are good intentions ever a sufficient excuse for bad consequences?

Immigration Creates a Commons

I come now to the final example of a commons in action, one for which the public is least prepared for rational discussion. The topic is at present enveloped by a great silence which reminds me of a comment made by Sherlock Holmes in A. Conan Doyle's story, "Silver Blaze." Inspector Gregory had asked, "Is there any point to which you would wish to draw my attention?" To this Holmes responded:

> "To the curious incident of the dog in the night-time."
>
> "The dog did nothing in the night-time," said the Inspector.
>
> "That was the curious incident," remarked Sherlock Holmes.

By asking himself what would repress the normal barking instinct of a watch dog Holmes realized that it must be the dog's recognition of his master as the criminal trespasser. In a similar way we should ask ourselves what repression keeps us from discussing something as important as immigration?

It cannot be that immigration is numerically of no consequence. Our government acknowledges a net inflow of 400,000 a year. Hard data are understandably lacking on the extent of illegal entries, but a not implausible figure is 600,000 per year (Buchanan 1973). The natural increase of the resident population is now about 1.7 million per year. This means that the yearly gain from immigration is at least 19%, and may be 37%, of the total increase. It is quite conceivable that educational campaigns like that of Zero Population Growth, Inc., coupled with adverse social and economic factors — inflation, housing shortage, depression, and loss of confidence in national leaders — may lower the fertility of American women to a point at which all of the yearly increase in population would be accounted for by immigration. Should we not at least ask if that is what we want? How curious it is that we so seldom discuss immigration these days!

Curious, but understandable — as one finds out the moment he publicly questions the wisdom of the status quo in immigration. He who does so is promptly charged with *isolationism, bigotry, prejudice, ethnocentrism, chauvinism,* and *selfishness.* These are hard accusations to bear. It is pleasanter to talk about other matters, leaving immigration policy to wallow in the cross-currents of special interests that take no account of the good of the whole — or of the interests of posterity.

We Americans have a bad conscience because of things we said in the past about immigrants. Two generations ago the popular press was rife with references to *Dagos, Wops, Pollacks, Japs, Chinks,* and *Krauts* — all pejorative terms which failed to acknowledge our indebtedness to Goya, Leonardo, Copernicus, Hiroshige, Confucius, and Bach. Because the implied inferiority of foreigners was then the justification for keeping them out, it is now thoughtlessly assumed that restrictive policies can only be based on the assumption of immigrant inferiority. This is not so.

[more →]

Existing immigration laws exclude idiots and known criminals; future laws will almost certainly continue this policy. But should we also consider the quality of the average immigrant, as compared with the quality of the average resident? Perhaps we should, perhaps we shouldn't. (What is "quality" anyway?) But the quality issue is not our concern here.

From this point on, it will be assumed that immigrant and native-born citizens are of exactly equal quality, however quality may be defined. The focus is only on quantity. The conclusions reached depend on nothing else, so all charges of ethnocentrism are irrelevant.

World food banks move food to the people, thus facilitating the exhaustion of the environment of the poor. By contrast, unrestricted immigration moves people to the food, thus speeding up the destruction of the environment in rich countries. Why poor people should want to make this transfer is no mystery: but why should rich hosts encourage it? This transfer, like the reverse one, is supported by both selfish interests and humanitarian impulses.

The principal selfish interest in unimpeded immigration is easy to identify: it is the interest of the employers of cheap labor, particularly that needed for degrading jobs. We have been deceived about the forces of history by the lines of Emma Lazarus inscribed on the Statue of Liberty:

> *Give me your tired, your poor*
> *Your huddled masses yearning to breathe free,*
> *The wretched refuse of your teeming shore,*
> *Send these, the homeless, tempest-tossed, to me:*
> *I lift my lamp beside the golden door.*

The image is one of an infinitely generous earth-mother, passively opening her arms to hordes of immigrants who come here on their own initiative. Such an image may have been adequate for the early days of colonization, but by the time these lines were written (1886) the force for immigration was largely manufactured inside our own borders by factory and mine owners who sought cheap labor not to be found among laborers already here. One group of foreigners after another was thus enticed into the United States to work at wretched jobs for wretched wages.

At present, it is largely the Mexicans who are being so exploited. It is particularly to the advantage of certain employers that there be many illegal immigrants. Illegal immigrant workers dare not complain about their working conditions for fear of being repatriated. Their presence reduces the bargaining power of all Mexican-American laborers. Cesar Chavez has repeatedly pleaded with congressional committees to close the doors to more Mexicans so that those here can negotiate effectively for higher wages and decent working conditions. Chavez understands the ethics of a lifeboat.

The interests of the employers of cheap labor are well served by the silence of the intelligentsia of the country. WASPS — White Angle-Saxon Protestants — are particularly reluctant to call for a closing of the doors to immigration for fear of being called ethnocentric bigots. It was, therefore, an occasion of pure delight for this particular WASP to be present at a meeting when the points he would like to have made were made better by a non-WASP speaking to other non-WASPS. It was in Hawaii, and most of the people in the room were second-level Hawaiian officials of Japanese ancestry. All Hawaiians are keenly aware of the limits of their environment, and the speaker had asked how it might be practically and constitutionally possible to close the doors to more immigrants to the islands. (To Hawaiians, immigrants from the other 49 states are as much of a threat as those from other nations. There is only so much room in the islands, and the islanders know it. Sophistical arguments that imply otherwise do not impress them.)

> **. . . trying to wrap up water in a Christmas package made of paper and string – if the water falls out, you pull the string tighter . . . it's as good a diagnosis of what the world is trying to do as any, you know . . .**
>
> – *Gregory Bateson*

[Sent by Judy Van Slooten]

Yet the Japanese-Americans of Hawaii have active ties with the land of their origin. This point was raised by a Japanese-American speaker: "But how can we shut the doors now? We have many friends and relations in Japan that we'd like to bring to Hawaii some day so that they can enjoy this beautiful land.

The speaker smiled sympathetically and responded slowly: "Yes, but we have children now and someday we'll have grandchildren. We can bring more people here from Japan only by giving away some of the land that we hope to pass on to our grandchildren some day. What right do we have to do that?"

To be generous with one's own possessions is one thing; to be generous with posterity's is quite another. This, I think, is the point that must be gotten across to those who would, from a commendable love of distributive justice, institute a ruinous sytem of the commons, either in the form of a world food bank or that of unrestricted immigration. Since every speaker is a member of some ethnic group it is always possible to charge him with ethnocentrism. But even after purging an argument of ethnocentrism the rejection of the commons is still valid and necessary if we are to save at least some parts of the world from environmental ruin. Is it not desirable that at least some of the grandchildren of people now living should have a decent place in which to live?

The Asymmetry of Door-Shutting

We must now answer this telling point: "How can you justify slamming the door once you're inside? You say that immigrants should be kept out. But aren't we all immigrants, or the descendants of immigrants? Since we refuse to leave, must we not, as a matter of justice and symmetry, admit all others?"

It is literally true that we Americans of non-Indian ancestry are the descendants of thieves. Should we not, then, "give back" the land to the Indians; that is, give it to the now-living Americans of Indian ancestry? As an exercise in pure logic I see no way to reject this proposal. Yet I am unwilling to live by it; and I know no one who is. Our reluctance to embrace pure justice may spring from pure selfishness. On the other hand, it may arise from an unspoken recognition of consequences that have not yet been clearly spelled out.

Suppose, becoming intoxicated with pure justice, we "Anglos" should decide to turn our land over to the Indians. Since all our other wealth has also been derived from the land, we would have to give that to the Indians, too. Then what would we non-Indians do? Where would we go? There is no open land in the world on which men without capital can make their living (and not much unoccupied land on which men with capital can either). Where would 209 million putatively justice-loving, non-Indian, Americans go? Most of them — in the persons of their ancestors — came from Europe, but they wouldn't be welcomed back there. Anyway, Europeans have no better title to their land than we to ours. They also would have to give up their homes. (But to whom? And where would they go?)

Clearly, the concept of pure justice produces an infinite regress. The law long ago invented statutes of limitations to justify the rejection of pure justice, in the interest of preventing massive disorder. The law zealously defends property rights — but only recent property rights. It is as though the physical principle of exponential decay applies to property rights. Drawing a line in time may be unjust, but any other action is practically worse.

We are all the descendants of thieves, and the world's resources are inequitably distributed, but we must begin the journey to tomorrow from the point where we are today. We cannot remake the past. We cannot, without violent disorder and suffering, give land and resources back to the "original" owners — who are dead anyway.

We cannot safely divide the wealth equitably among all present peoples, so long as people reproduce at different rates, because to do so would guarantee that our grandchildren — everyone's grandchildren — would have only a ruined world to inhabit.

Must Exclusion Be Absolute?

To show the logical structure of the immigration problem I have ignored many factors that would enter into real decisions made in a real world. No matter how convincing the logic may be it is probable that we would want, from time to time, to admit a few people from the outside to our lifeboat. Political refugees in particular are likely to cause us to make exceptions: We remember the Jewish refugees from Germany after 1933, and the Hungarian refugees after 1956. Moreover, the interests of national defense, broadly conceived, could justify admitting many men and women of unusual talents, whether refugees or not. (This raises the quality issue, which is not the subject of this essay.)

Such exceptions threaten to create runaway population growth inside the lifeboat, i.e., the receiving country. However, the threat can be neutralized by a population policy that includes immigration. An effective policy is one of flexible control.

Suppose, for example, that the nation has achieved a stable condition of ZPG, which (say) permits 1.5 million births yearly. We must suppose that an acceptable system of allocating birth-rights to potential parents is in effect. Now suppose that an inhumane regime in some other part of the world creates a horde of refugees, and that there is a widespread desire to admit some to our country. At the same time, we do not want to sabotage our population control system. Clearly, the rational path to pursue is the following. If we decide to admit 100,000 refugees this year we should compensate for this by reducing the allocation of birth-rights in the following year by a similar amount, that is downward to a total of 1.4 million. In that way we could achieve both humanitarian and population control goals. (And the refugees would have to accept the population controls of the society that admits them. It is not inconceivable that they might be given proportionately fewer rights than the native population.)

In a democracy, the admission of immigrants should properly be voted on. But by whom? It is not obvious. The usual rule of a democracy is votes for all. But it can be questioned whether a universal franchise is the most just one in a case of this sort. Whatever benefits there are in the admission of immigrants presumably accrue to everyone. But the costs would be seen as falling most heavily on potential parents, some of whom would have to postpone or forego having their (next) child because of the influx of immigrants. The double question Who benefits? Who pays? suggests that a restriction of the usual democratic franchise would be appropriate and just in this case. Would our particular quasi-democratic form of government be flexible enough to institute such a novelty? If not, the majority might, out of humanitarian motives, impose an unacceptable burden (the foregoing of parenthood) on a minority, thus producing political instability.

Plainly many new problems will arise when we consciously face the immigration question and seek rational answers. No workable answers can be found if we ignore population problems. And — if the argument of this essay is correct — so long as there is no true world government to control reproduction everywhere it is impossible to survive in dignity if we are to be guided by Spaceship ethics. Without a world government that is sovereign in reproductive matters mankind lives, in fact, on a number of sovereign lifeboats. For the foreseeable future survival demands that we govern our actions by the ethics of a lifeboat. Posterity will be ill served if we do not. ■

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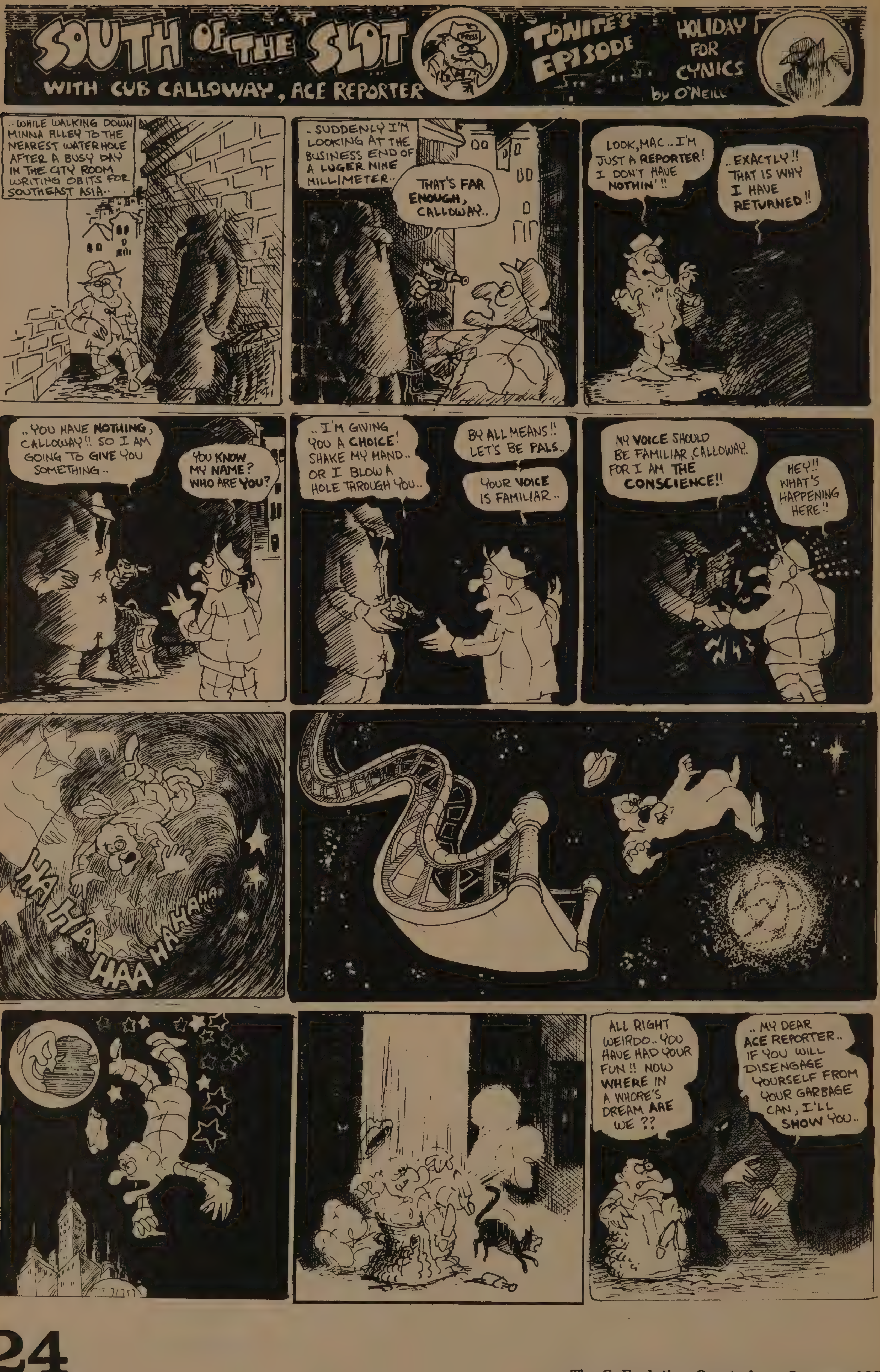
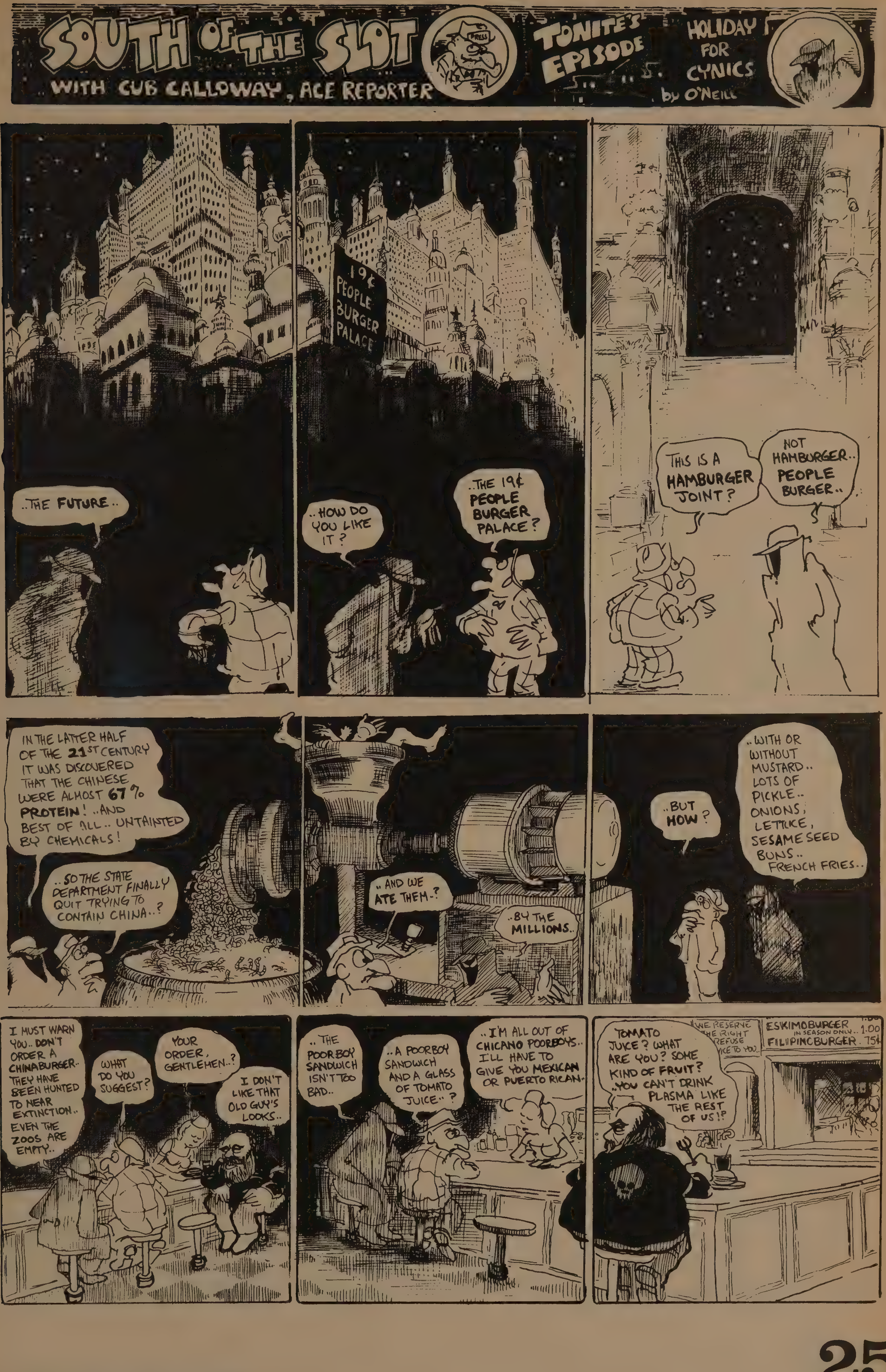
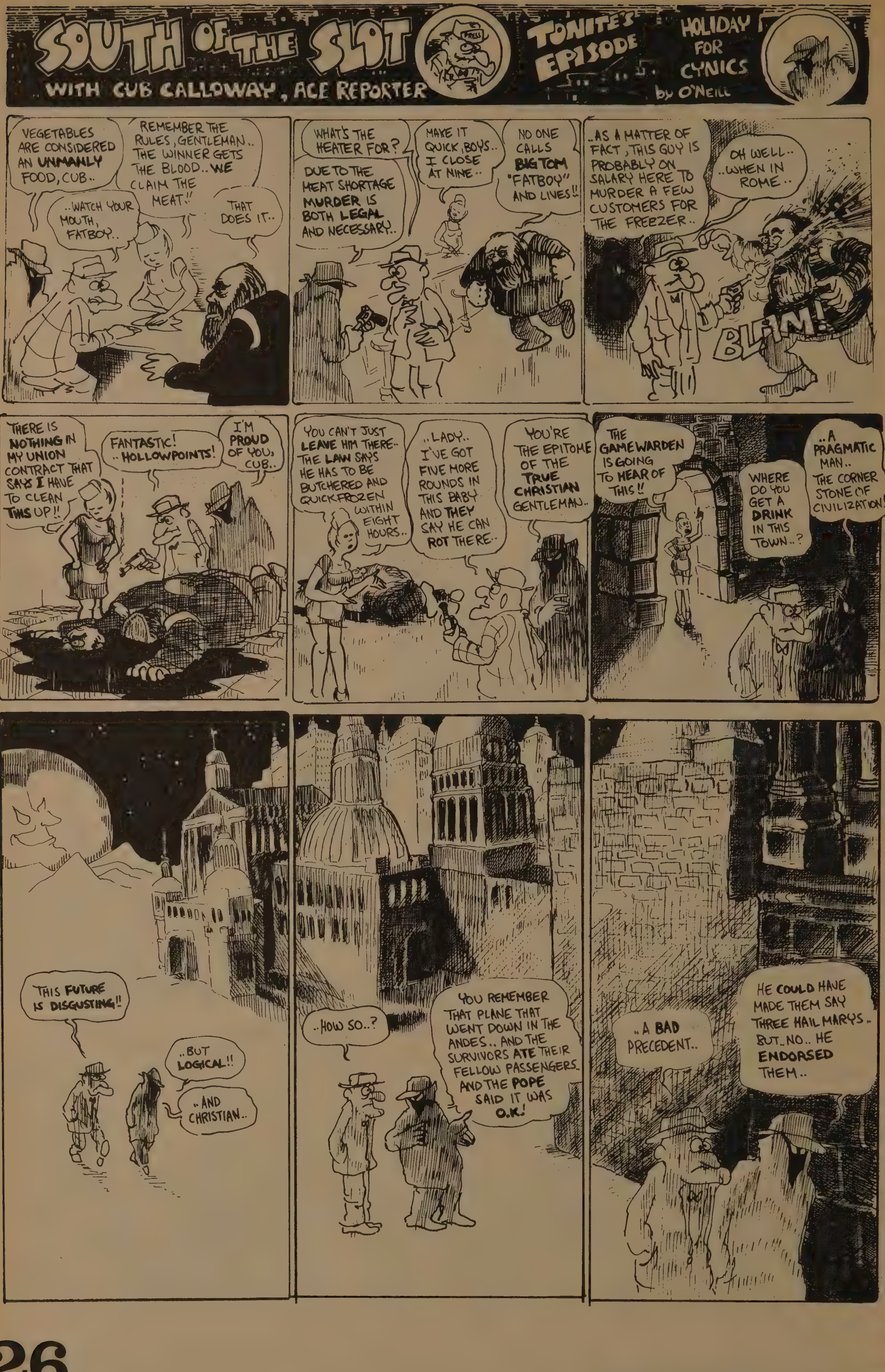
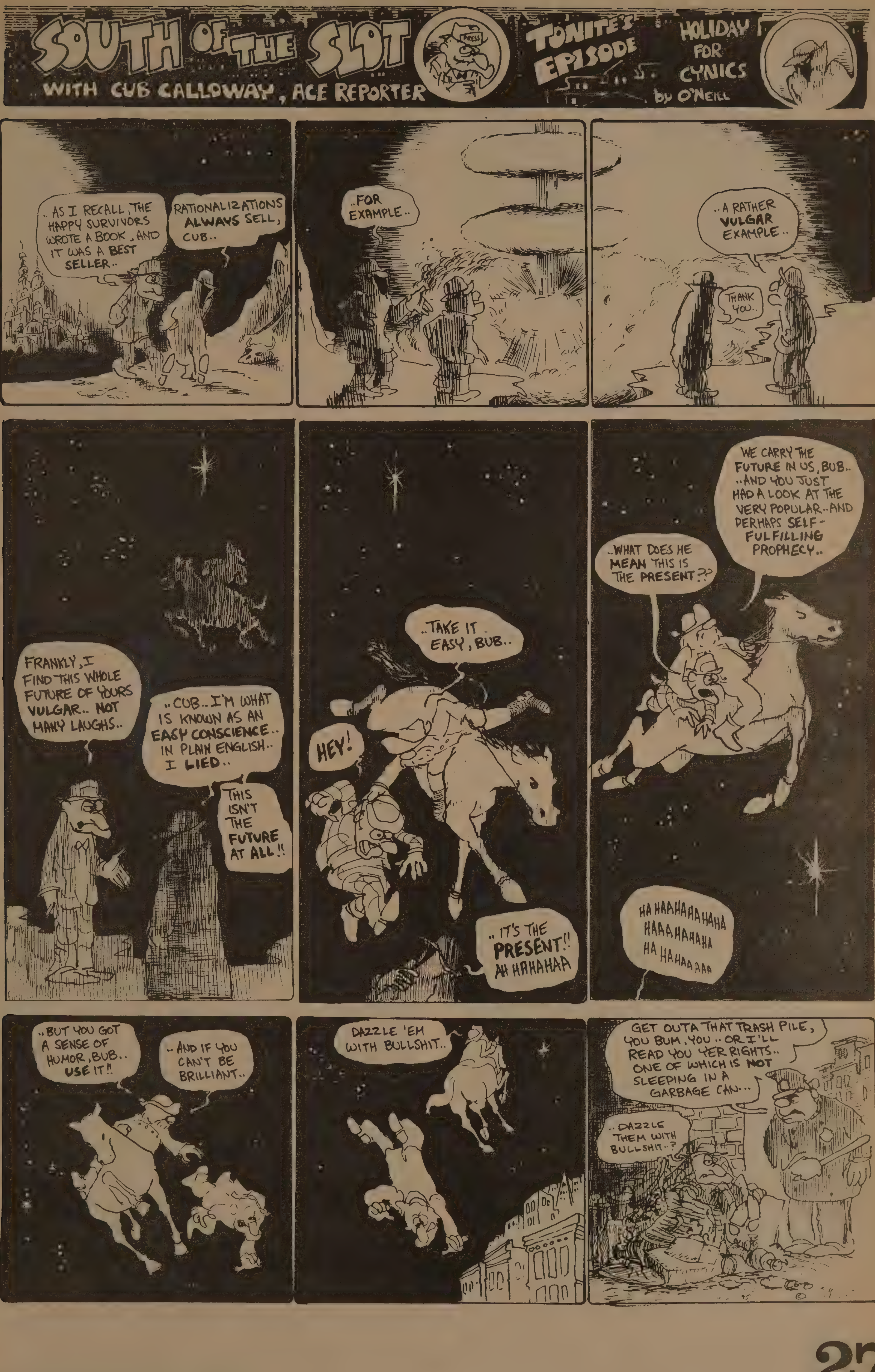

SOUTH OF THE SLOT
WITH CUB CALLOWAY, ACE REPORTER
PRESS
TONITE'S EPISODE
HOLIDAY FOR CYNICS
by O'NEILL
..WHILE WALKING DOWN MINNA ALLEY TO THE NEAREST WATERHOLE AFTER A BUSY DAY IN THE CITY ROOM WRITING OBITS FOR SOUTHEAST ASIA..
..SUDDENLY I'M LOOKING AT THE BUSINESS END OF A LUGER NINE MILLIMETER..
THAT'S FAR ENOUGH, CALLOWAY..
LOOK, MAC.. I'M JUST A REPORTER! I DON'T HAVE NOTHIN'!!
..EXACTLY!! THAT IS WHY I HAVE RETURNED!!
..YOU HAVE NOTHING, CALLOWAY!! SO I AM GOING TO GIVE YOU SOMETHING..
YOU KNOW MY NAME? WHO ARE YOU?
..I'M GIVING YOU A CHOICE! SHAKE MY HAND.. OR I BLOW A HOLE THROUGH YOU..
BY ALL MEANS!! LET'S BE PALS..
YOUR VOICE IS FAMILIAR..
MY VOICE SHOULD BE FAMILIAR, CALLOWAY.. FOR I AM THE CONSCIENCE!!
HEY!! WHAT'S HAPPENING HERE!!
HA HA HAA HAHAHAHA
ALL RIGHT WEIRDO.. YOU HAVE HAD YOUR FUN!! NOW WHERE IN A WHORE'S DREAM ARE WE??
..MY DEAR ACE REPORTER.. IF YOU WILL DISENGAGE YOURSELF FROM YOUR GARBAGE CAN, I'LL SHOW YOU..


SOUTH OF THE SLOT
..WITH CUB CALLOWAY, ACE REPORTER
PRESS
TONITE'S EPISODE
HOLIDAY FOR CYNICS
by O'NEILL
..THE FUTURE..
19¢ PEOPLE BURGER PALACE
..HOW DO YOU LIKE IT?
..THE 19¢ PEOPLE BURGER PALACE?
THIS IS A HAMBURGER JOINT?
NOT HAMBURGER.. PEOPLE BURGER..
IN THE LATTER HALF OF THE 21ST CENTURY IT WAS DISCOVERED THAT THE CHINESE WERE ALMOST 67% PROTEIN! ..AND BEST OF ALL.. UNTAINTED BY CHEMICALS!
..SO THE STATE DEPARTMENT FINALLY QUIT TRYING TO CONTAIN CHINA..?
..AND WE ATE THEM..?
..BY THE MILLIONS..
..BUT HOW?
..WITH OR WITHOUT MUSTARD.. LOTS OF PICKLE.. ONIONS, LETTUCE, SESAME SEED BUNS.. FRENCH FRIES..
I MUST WARN YOU.. DON'T ORDER A CHINABURGER.. THEY HAVE BEEN HUNTED TO NEAR EXTINCTION.. EVEN THE ZOOS ARE EMPTY..
WHAT DO YOU SUGGEST?
YOUR ORDER, GENTLEMEN..?
I DON'T LIKE THAT OLD GUY'S LOOKS..
..THE POORBOY SANDWICH ISN'T TOO BAD..
..A POORBOY SANDWICH AND A GLASS OF TOMATO JUICE..?
..I'M ALL OUT OF CHICANO POORBOYS.. I'LL HAVE TO GIVE YOU MEXICAN OR PUERTO RICAN..
TOMATO JUICE? WHAT ARE YOU? SOME KIND OF FRUIT? ..YOU CAN'T DRINK PLASMA LIKE THE REST OF US!?
WE RESERVE THE RIGHT REFUSE VICE TO YOU..
ESKIMOBURGER IN SEASON ONLY.. 1.00
FILIPINOBURGER. 75¢


SOUTH OF THE SLOT
WITH CUB CALLOWAY, ACE REPORTER
PRESS
TONITE'S EPISODE
HOLIDAY FOR CYNICS
by O'NEILL
VEGETABLES ARE CONSIDERED AN UNMANLY FOOD, CUB..
REMEMBER THE RULES, GENTLEMAN.. THE WINNER GETS THE BLOOD.. WE CLAIM THE MEAT!!
..WATCH YOUR MOUTH, FATBOY..
THAT DOES IT..
WHAT'S THE HEATER FOR?
DUE TO THE MEAT SHORTAGE MURDER IS BOTH LEGAL AND NECESSARY..
MAKE IT QUICK, BOYS.. I CLOSE AT NINE..
NO ONE CALLS BIG TOM "FATBOY" AND LIVES!!
..AS A MATTER OF FACT, THIS GUY IS PROBABLY ON SALARY HERE TO MURDER A FEW CUSTOMERS FOR THE FREEZER..
OH WELL.. ..WHEN IN ROME..
BLAM!
THERE IS NOTHING IN MY UNION CONTRACT THAT SAYS I HAVE TO CLEAN THIS UP!!
FANTASTIC! ..HOLLOWPOINTS!
I'M PROUD OF YOU, CUB..
YOU CAN'T JUST LEAVE HIM THERE.. THE LAW SAYS HE HAS TO BE BUTCHERED AND QUICKFROZEN WITHIN EIGHT HOURS..
..LADY.. I'VE GOT FIVE MORE ROUNDS IN THIS BABY AND THEY SAY HE CAN ROT THERE..
YOU'RE THE EPITOME OF THE TRUE CHRISTIAN GENTLEMAN..
THE GAMEWARDEN IS GOING TO HEAR OF THIS!!
WHERE DO YOU GET A DRINK IN THIS TOWN..?
..A PRAGMATIC MAN.. THE CORNER STONE OF CIVILIZATION!
THIS FUTURE IS DISGUSTING!!
..BUT LOGICAL!!
..AND CHRISTIAN..
..HOW SO..?
YOU REMEMBER THAT PLANE THAT WENT DOWN IN THE ANDES.. AND THE SURVIVORS ATE THEIR FELLOW PASSENGERS.. AND THE POPE SAID IT WAS O.K.!
..A BAD PRECEDENT..
HE COULD HAVE MADE THEM SAY THREE HAIL MARYS.. BUT..NO.. HE ENDORSED THEM..


SOUTH OF THE SLOT
..WITH CUB CALLOWAY, ACE REPORTER
PRESS
TONITE'S EPISODE
HOLIDAY FOR CYNICS
by O'NEILL
..AS I RECALL, THE HAPPY SURVIVORS WROTE A BOOK, AND IT WAS A BEST SELLER..
RATIONALIZATIONS ALWAYS SELL, CUB..
..FOR EXAMPLE..
..A RATHER VULGAR EXAMPLE..
THANK YOU..
FRANKLY, I FIND THIS WHOLE FUTURE OF YOURS VULGAR.. NOT MANY LAUGHS..
..CUB.. I'M WHAT IS KNOWN AS AN EASY CONSCIENCE.. IN PLAIN ENGLISH.. I LIED..
THIS ISN'T THE FUTURE AT ALL!!
..TAKE IT EASY, BUB..
HEY!
..IT'S THE PRESENT!! AH HAHAHAA
WE CARRY THE FUTURE IN US, BUB.. ..AND YOU JUST HAD A LOOK AT THE VERY POPULAR..AND PERHAPS SELF-FULFILLING PROPHECY..
..WHAT DOES HE MEAN THIS IS THE PRESENT??
HA HAAHAHAHAHA HAAAHAHAHA HA HAHAAAAA
..BUT YOU GOT A SENSE OF HUMOR, BUB.. USE IT!!
..AND IF YOU CAN'T BE BRILLIANT..
DAZZLE 'EM WITH BULLSHIT..
GET OUTA THAT TRASH PILE, YOU BUM, YOU.. OR I'LL READ YOU YER RIGHTS.. ONE OF WHICH IS NOT SLEEPING IN A GARBAGE CAN..
..DAZZLE THEM WITH BULLSHIT..?

Three From Space

BY CARL SAGAN

One of the many benefits of space flight are the exquisite photographs of the Earth which have been returned — at first almost as an accidental by-product. Now manned Earth orbital missions and unmanned meteorological and Earth resources satellites regularly return a bonanza of portraits of our planet with ground resolutions ranging from hundreds of kilometers to tens of meters. In such photographs we can discern much of the intricate and exquisite meteorology, geology and biology of our planet. It is impossible to view such pictures without acquiring a new perspective on our tiny world: "If we could but see ourselves as others do." The "others" are a little uncertain still, but there is no doubt that viewing the best color photographs of the Earth is an act of enlightenment for the geologist, meteorologist and biologist; for the planetary scientist interested in comparing other planets with his own; and for those simply interested in an unparalleled aesthetic experience.

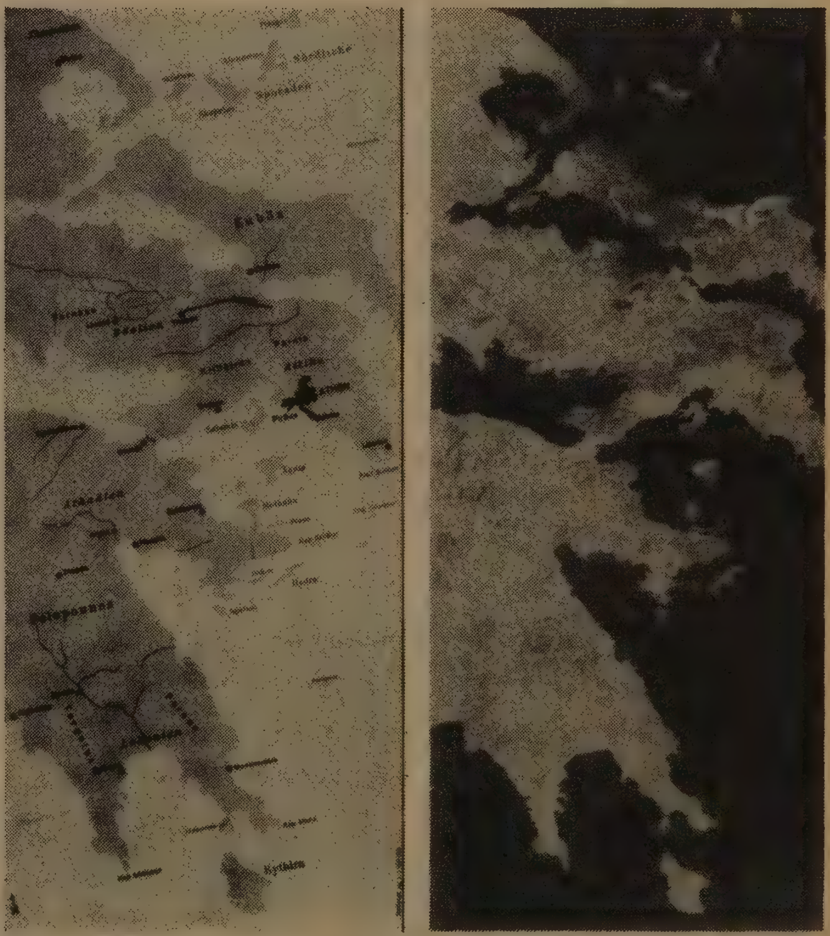
Unfortunately, despite the fact that without exception the finest color photographs of the Earth have been taken from United States spacecraft, there has been little attempt in this country to publish representative (much less comprehensive) atlases of Earth photography. A few such photographs have been published in the NASA publication **This Island Earth** some years ago. Several books of Earth photographs have been published, written by NASA geologist Paul Lowman and printed in Switzerland. The latest, **The Third Planet: Terrestrial Geology in Orbital Photographs**, is instructive and well-produced and is a very useful adjunct to any study of the Earth. It uses exclusively Gemini and Apollo photographs from hand-held cameras.

But there are two new publications which deserve very serious attention. In 1969 List Verlag in Munich published the original German edition of **The Earth from Space** by the German scientists Bodechtel and Gierloff-Emden, who evidently prevailed upon the American Embassy in Bonn to provide their material. Professor Bodechtel is a geologist, Professor Gierloff-Emden a geographer. We now have available the English edition of this work and, in German, another more comprehensive book by the same authors. Both books are beautifully produced. The more recent one shows a very wide variety of locales and phenomena; the earlier book has something of a fixation on the Arabian peninsula. Both works are graced by excellent color key maps which greatly illuminate the photographs. There is also an accompanying text which provides excellent short descriptions of what we see; it is particularly useful in the geological sciences. We have volcanoes, rift valleys, impact craters, sand dunes, coral atolls; a placid looking "Bermuda triangle"; a snowy Denver nestling at the foot of the Rockies; an exquisite photograph of Nepal, the Himalayas and Mt. Everest; the flood plain of the Ganges; bushfires in northern Australia; a multitude of sinuous tributaried rivers; astonishing polar terrain and ice floes; and at about 100 meters resolution a wide variety of lines of evidence that the Earth is inhabited by creatures enamoured of squares and rectangles. [As a calibration for the photographic reconnaissance of Mars at resolution of 1 kilometer to 100 meters such photographs have been studied in two papers called: "A Search for Life on Earth at Kilometer Resolution", Kilston et al., **Icarus**, 5, 79, 1966; and

Carl Sagan is, among other noteworthy things (see Sagan's Conjecture, p. 7), editor of the excellent space science journal **Icarus**, *$121.50/yr. (monthly) from Academic Press, 111 Fifth Ave., New York, NY 10003.*

— SB

India — Gemini 11. From **The Third Planet**



Southeast Greece and the Aegean Sea. From **Weltraumbilder**

The Third Planet
(Terrestrial Geology in
Orbital Photographs)
Paul D. Lowman, Jr.
1972; 165pp.
$32.00 + $10.00 airmail post.
from:
Weltflugbild
Verlag Reinhold A. Muller
Feldmeilen
Zurich, Switzerland

Weltraumbilder
(die dritte Entdeckung der Erde)
J. Bodechtel & H.-G. Gierloff-Emden
1974; 207pp.
$15.00 + $7.20 airmail post.
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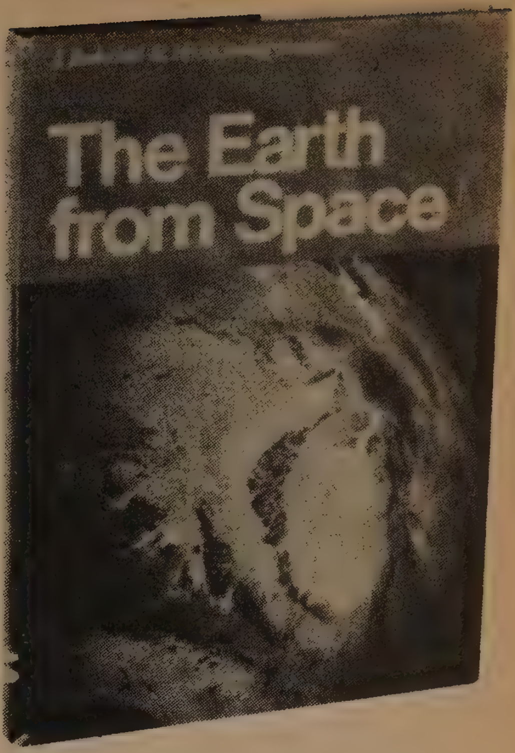
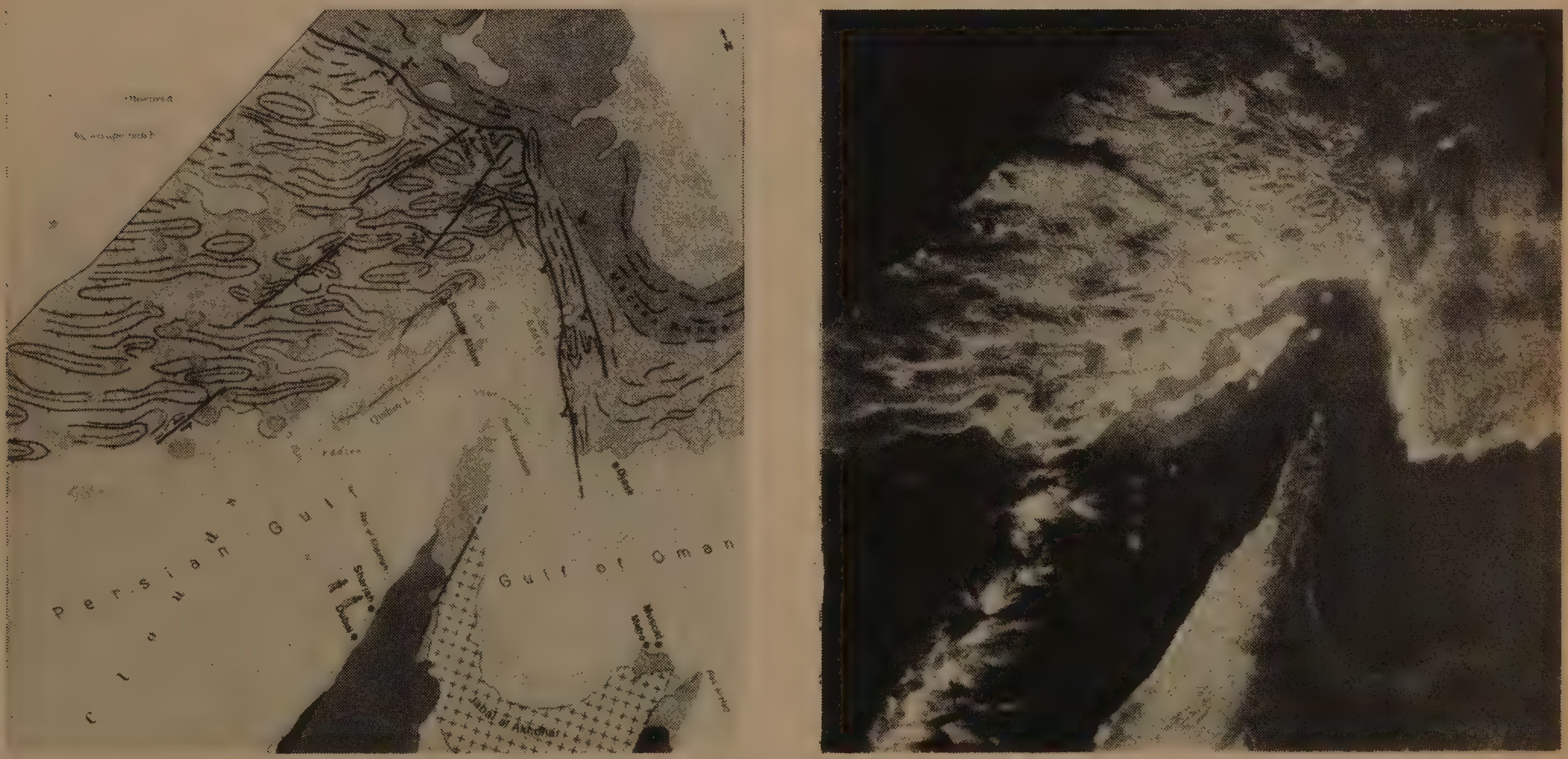


The Earth from Space
J. Bodechtel & H.-G. Gierloff-Emden
1974; 176pp.
$16.95 postpaid
from:
Arco Pub. Co., Inc.
219 Park Ave. South
New York, NY 10003
or Whole Earth

"A Search for Life at Hundred Meter Resolution", Sagan and Wallace, **Icarus**, 15, 515, 1971.] The photographs in **The Earth from Space** are primarily from Gemini and Apollo; those in **Weltraumbilder die dritte Entdeckung der Erde** are primarily from ERTS and Skylab.

There are useful descriptions of observational techniques and only a few gaffes or important omissions: such as the statement that the Apollo color photographs of the Moon represent true greens, blues and browns; or, in a chapter on "Flying Spies", an omission of any hint that such techniques might have some politically stabilizing military function. Some of the definitions in the glossary are understandable but less than accurate: such as the definition of lasers as "very powerful and narrow beams of light".

After the publication of **The Earth from Space**, Bodechtel and Gierloff-Emden were evidently made principal investigators on subsequent NASA Earth orbital photography missions, so that they now can get their data directly. The American Embassy in Bonn is apparently freed for other functions. The authors and publishers are to be congratulated on their choice and exposition of photographs and the quality of photographic reproduction. I hope that **Weltraumbilder die dritte Entdeckung der Erde** will appear in a high quality English language edition. Both books should be in every library. ■



The Strait of Hormus, the gate to the Persian Gulf. From **The Earth from Space**

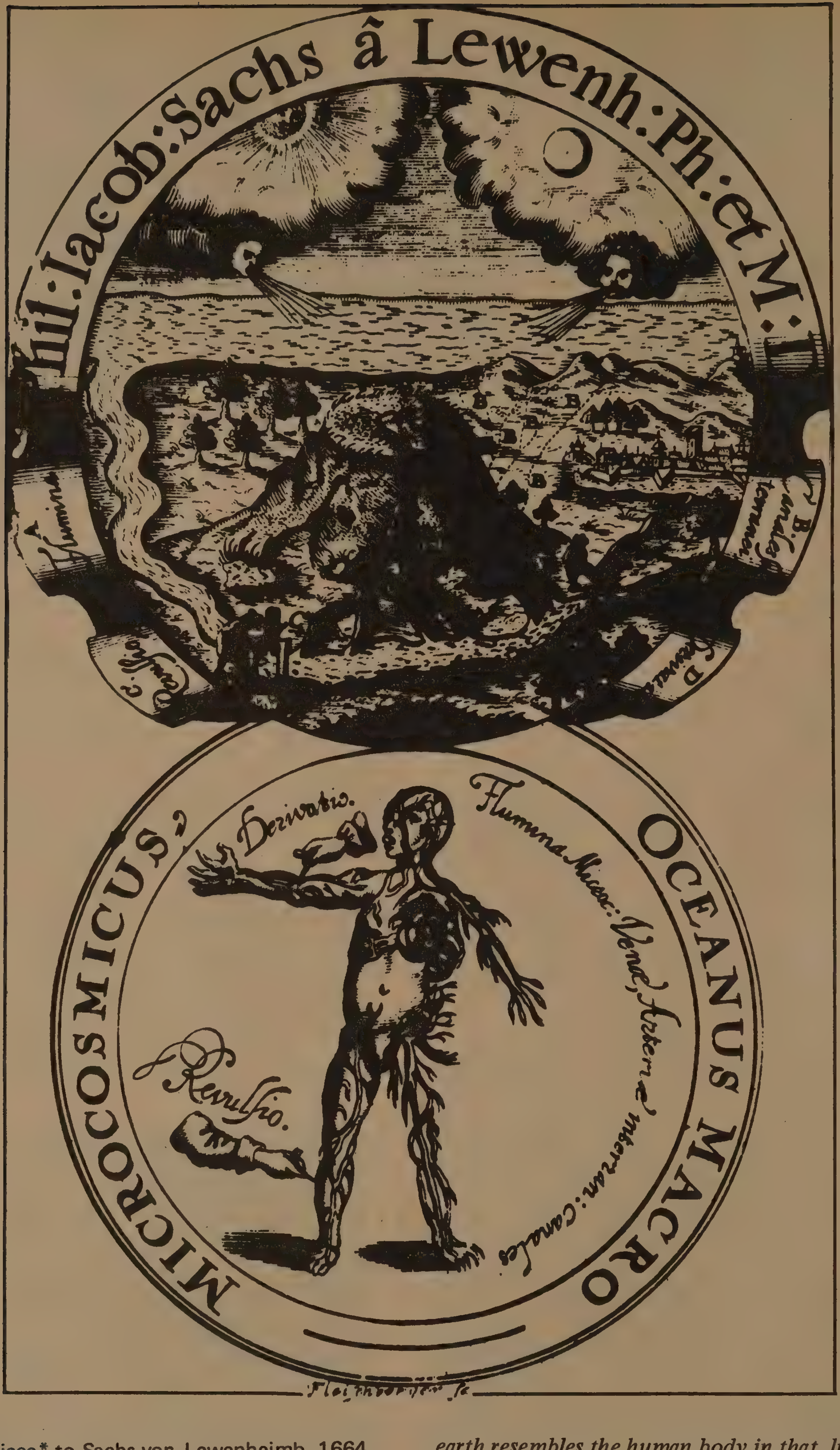

hil: Iacob: Sachs â Lewenh: Ph: et M: D
A Flumina
B Canales terranei
D
MICROCOSMICUS,
OCEANUS MACRO
Derivatio.
Flumina Macro: Venae, Arteriae internae: canales
Revulsio.

FIGURE 1. Frontispiece* to Sachs von Lewenheimb, 1664, **Oceanus Macro-Microcosmicus.** This illustration stresses the analogies between the circulation of the blood and the circulation of water. According to W. Pagel (1), *"The subtitle of the dissertation (which addresses itself to the famous anatomist Thomas Bartholinus) explains that it deals with the analogies between the circular motion of the water from and back to the sea, on the one hand, and that of the blood from and back to the heart, on the other. This motion is "circular," not because it describes the geometrical figure of a circle, but because it reverts to its point of departure. The earth resembles the human body in that, like the latter, it is pervaded by canals and harbours an internal fire. The sea lets water rise by evaporation and return in the form of rain whereby the rivers and subterranean waters are nourished and these finally return the same water to the sea. The latter thereby acts not unlike the heart from which the blood goes out to the organs, starting on its way attenuated by the influx of heat and 'perfected' in the 'workshops' of the organs; finally, after its absorption and assimilation by the organs, its residue is drawn back into the heart in order to be attenuated again – just as the waters are diluted by joining the sea."*

***From the original treatise in the Wellcome Library by courtesy of the trustees.**

The Atmosphere as Circulatory System of the Biosphere — The **Gaia** Hypothesis

BY LYNN MARGULIS AND JAMES E. LOVELOCK

We would like to discuss the Earth's atmosphere from a new point of view — that it is an integral, regulated, and necessary part of the biosphere. In 1664 Sachs von Lewenheimb, a champion of William Harvey, used the analogy shown in Figure 1 to illustrate the concept of the circulation of blood. Apparently the idea that water lost to the heavens is eventually returned to Earth was so acceptable in von Lewenheimb's time that Harvey's theory was strengthened by the analogy (1).

Three hundred and ten or so years later, with the circulation of blood a universally accepted fact, we find it expedient to revive von Lewenheimb's analogy — this time to illustrate our concept of the atmosphere as circulatory system of the biosphere. This new way of viewing the Earth's atmosphere has been called the "Gaia" hypothesis (2). The term Gaia is from the Greek for "Mother Earth," and it implies that certain aspects of the Earth's atmosphere — temperature, composition, oxidation reduction state, and acidity —

The Gaia Hypothesis ("Gaia" is pronounced to rhyme with papaya) treats the anomalous Earth atmosphere as an artifact of life and comprehends the planet itself as a single life.

The two old puzzles — 1) How does the bizarre Earth atmosphere maintain itself? and 2) How does fragile Earth life maintain itself? — solve each other. It took two remarkable scientists — Margulis & Lovelock — meeting outside their specialties to discover that convergence.

Lynn Margulis is a microbiologist at Boston University. Her best-known contribution is the symbiotic theory of the origin of complex cells (her book Origin of Eukaryotic Cells *is reviewed on p. 41). Popularization of that theory in* The Lives of a Cell *won Lewis Thomas a National Book Award last month. He even perpetuated Dr. Margulis' misspelling — "*Myxotricha paradoxa*" (should be* Mixotricha*, she notes).*

James Lovelock is the envy of every scientist, a successful free-lancer. Working out of a thatched cottage in the Salisbury Plain, England, this biospheric chemist has accumulated some 69 patents — most of them in what he calls "gas pornography" — chromatographic analysis of gases at the parts-per-billion level. The New Scientist *recently wrote of him, "In some ways, Jim Lovelock — begetter of the Gaia hypothesis — is one of the last of the old-style natural philosophers. A scientist who works from his own home because he believes that lack of security encourages creativity, he has invented — among other things — 'a magnificent Pandora's box', the electron capture detector gas chromatograph. Most sensitive of the analytical chemist's tools, it has been responsible for arousing concern about pesticide residues and Freons in the stratosphere, and may yet help to show that, thanks to Gaia, our fears of pollution-extermination are unfounded."*

It is an honor for The CoEvolution Quarterly *to be the first non-specialist American publication to carry the Gaia Hypothesis. Margulis and Lovelock will doubtless take some flak for appearing in suspect company — condom evaluations, poetry, and such — but both seem comfortable that their science is sound enough to withstand the science-plus context. We are grateful to Carl Sagan, who put us in touch with Lynn Margulis, and to* Natural History *editor Alan Ternes, who will publish an expanded version of this article in his magazine in September or October.*

Gaia is an old idea. She is one of the four primary divine beings of the Ancient Greeks — Chaos (Space), Gaia (Earth), Tartarus (the Abyss), and Eros (Love). But Gaia is still a new hypothesis, containing more questions than answers.

It is too early for proofs, conclusions, or morals, beyond the one increasingly obvious, that as long as human activity works against the self-balancing of biosphere and atmosphere there is no Teilhardian noosphere in evidence, just a damned human cartel.

In Gaia we are — all — Tangled Up In Blue.

— SB

Copyright © 1975 by Lynn Margulis and James E. Lovelock.

form a homeostatic system, and that these properties are themselves products of evolution (3, 4).

From recent articles and books (e.g., 5 and 6) one gets the impression that fluid dynamics, radiation chemistry, and industrial pollution are the major factors determining the properties of the atmosphere. The Gaia hypothesis contends that biological gas exchange processes are also major factors, especially processes involving microorganisms. Man's impact on the atmosphere may have been overestimated. Man is only one of some three million species on Earth, all of which exchange gas and most of which exchange gas with the atmosphere. Man has been around for only a few million years while microorganisms have existed for thousands of millions of years. It is probably not so much the products of the several billion smaller organisms living in every pail of rich soil or water.

It seems to us that early 20th Century nonmicrobiological analysis of the Earth's lower atmosphere will one day be considered as ignorant as early 19th Century nonmicrobiological analysis of fermentation or disease is today.

In an excellent introduction to atmospheric science Goody and Walker (7) say, "There is a great difference between research in the laboratory and studies of the Earth and planets. In the laboratory the scientist can perform controlled experiments, each carefully designed to answer questions of his own choosing. Except in minor respects, however, the Earth and planets are too large for controlled experimentation. All we can do is observe what happens naturally in terms of the laws of physics and chemistry."

We agree that the laws of physics and chemistry are basic to the understanding of atmospheric phenomena but insist that the laws of biology must be considered as well. It is our contention that the paucity of overall understanding of certain aspects of the atmosphere, especially composition and temperature, is due to too narrow a paradigm: the idea that the atmosphere is an inert part of the inorganic environment and therefor amenable to methods of study that involve only physics and chemistry.

In this paper we explore what is perhaps a more realistic view — that the atmosphere is a nonliving, actively regulated part of the biosphere. In our model atmospheric temperature and composition are regulated with respect to certain biologically critical substances: hydrogen ions, molecular oxygen, nitrogen and its compounds, sulfur and its compounds, and some others, whose abundance and distribution in the atmosphere are presumed to be under biological control. Biological gas exchange processes, thought to be involved in possible control mechanisms, are discussed elsewhere (8). The purpose of this paper is simply to present our reasons for believing the atmosphere is actively controlled.

Traditional atmospheric studies have left us with some strange anomalies. The atmosphere is an extremely complex blanket of gas in contact with the oceans, lakes, rivers (the hydrosphere) and the rocky lithosphere. It has a mass of about 5.3×10^{21} grams.

Lynn Margulis

Gaia

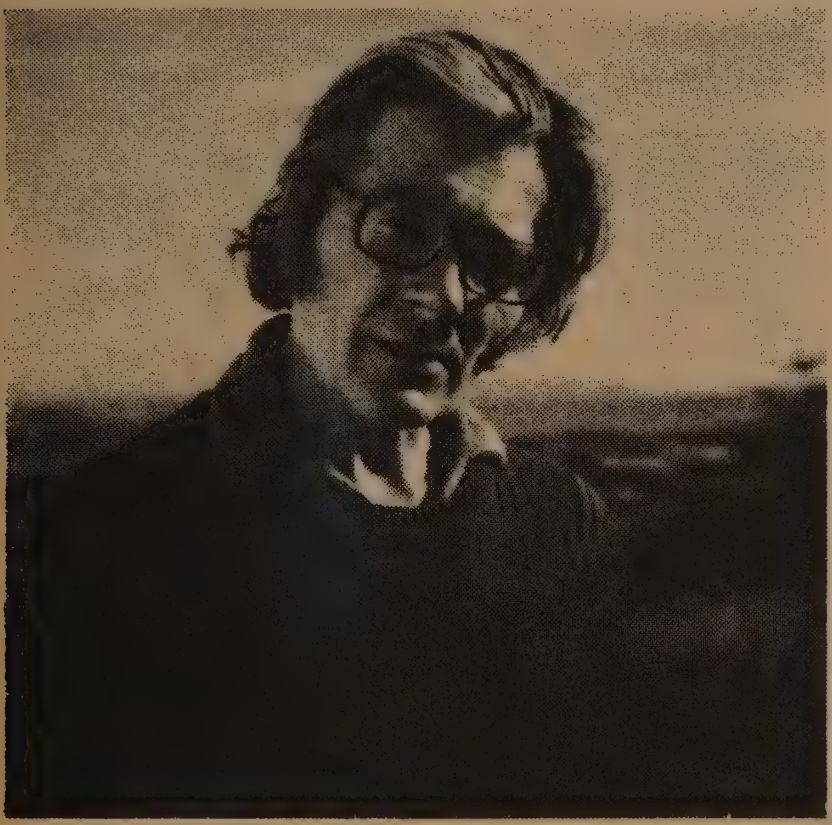
It appeared to us that the Earth's biosphere was able to control at least the temperature of the Earth's surface and the composition of the atmosphere. Prima facie, the atmosphere looked like a contrivance put together co-operatively by the totality of living systems to carry out certain necessary control functions. This led us to the formulation of the proposition that living matter, the air, the oceans, the land surface were parts of a giant system which was able to control temperature, the composition of the air and sea, the pH of the soil and so on so as to be optimum for survival of the biosphere. The system seemed to exhibit the behaviour of a single organism, even a living creature. One having such formidable powers deserved a name to match it; William Golding, the novelist, suggested Gaia — the name given by the ancient Greeks to their Earth goddess . . . .

Man's present activity as a polluter is trivial and he cannot thereby seriously change the present state of Gaia let alone hazard her existence. But there is an aspect of man's activities more disturbing than pollution. If one showed a control engineer the graph of the Earth's mean temperature against time over the past million years, he would no doubt remark that it represented the behaviour of a system in which serious instabilities could develop but which had never gone out of control. One of the laws of system control is that if a system is to maintain stability it must possess adequate variety of response, that is, have at least as many ways of countering outside disturbances as there are outside disturbances to act on it. What is to be feared is that man-the-farmer and man-the-engineer are reducing the total variety of response open to Gaia.

(The mass of the oceans — the other major fluid on the surface of the Earth — is almost a thousand times heavier, being about 1.4 x 10^{24} grams.) Since the atmospheric mass corresponds to less than a millionth of the mass of the Earth as a whole, one would expect small changes in the composition of the solid earth to cause large changes in the composition of the atmosphere. Yet even in the face of a large number of potential perturbations, the atmosphere seems to have remained dynamically constant over long periods of time.

Many facts about the atmosphere are known — its composition, its temperature and pressure profiles, certain interactions with incoming solar radiation, and the like (7). Some of these are shown in Tables 1 and 2. However as the efficacy of long range weather forecasting attests, there is no consistent model of the atmosphere that can be used for the purpose of prediction (6). The Earth's atmosphere defies simple description. From the point of view of chemistry it sustains such remarkable disequilibrium that Sagan (9) was prompted to remark that given the temperature, pressure, and amount of oxygen in the atmosphere, "one can calculate what the thermodynamic equilibrium abundance of methane ought to be . . . the answer turns out to be less than 1 part in 10^{36}. This then is a discrepancy of at least 30 orders of magnitude and cannot be dismissed lightly."

[more →]



James Lovelock

TABLE 1. Reactive gases in the atmosphere (billions of tons/year)

Gas	Concentration in parts per million	How much of the gas comes from			Residence time	Where does the gas come from principally?
		Inorganic Sources	Biological Sources			
		Volcanic, etc. ?	Gaian* ?	Human ?		
Nitrogen (N_2)	790,000	0.001	1	0	1-10 million years	bacteria from dissolved nitrate in soil
Oxygen (O_2)	210,000	0.00016	110	0	1000 years	algae and green plants, given off in photosynthesis
Carbon Dioxide (CO_2)	320	0.01	140	16	2-5 years	respiration, combustion
Methane (CH_4)	1.5	0	2	0	7 years	fermenting bacteria
Nitrous Oxide (N_2O)	0.3	less than 0.01	0.6	0	10 years	bacteria and fungi
Carbon Monoxide (CO)	0.08	less than 0.001	1.5	0.15	a few months	from methane oxidation (methane from bacteria)
Ammonia (NH_3)	0.006	0	1.5	0	a week	bacteria and fungi
Hydrocarbons $(CH_2)_n$	0.001	0	0.2	0.2	hours	green plants, industry
Methyl Iodide (CH_3I)	0.000001	0	0.03	0	hours	marine algae
Hydrogen (H_2)	0.0000005	0	?	?	2 years	bacteria, methane oxidation?
Methyl Chloride (CH_3Cl)	0.00000000114	0	?	?	?	algae?

*Gaian = nonhuman biological sources.

The growing human population of the Earth is leading us to use drastic measures to supply this population with resources, of which food has prime importance. Natural distribution of plants and animals are being changed, ecological systems destroyed and whole species altered or deleted. But any species or group of species in an ecological association may contribute just that response to an external threat that is needed to maintain the stability of Gaia. We therefore disturb and eliminate at our peril; long before the world population has grown so large that we consume the entire output from photosynthesisers, instabilities generated by lack of variety of response could intervene to put this level out of reach . . . .

Now for one more speculation. We are sure that man needs Gaia but could Gaia do without man? In man, Gaia has the equivalent of a central nervous system and an awareness of herself and the rest of the Universe. Through man, she has a rudimentary capacity, capable of development, to anticipate and guard against threats to her existence. For example, man can command just about enough capacity to ward off a collision with a planetoid the size of Icarus. Can it then be that in the course of man's evolution within Gaia he has been acquiring the knowledge and skills necessary to ensure her survival?

Excerpted from "The Quest for Gaia",
by James Lovelock & Sydney Epton,
The New Scientist, *6 Feb 75*

TABLE 2. Composition of the atmosphere: gases in disequilibrium

Gas	Abundance	Flux (moles/yr x 10^{13})	Disequilibrium factor	Oxygen used up in the oxidation of these gases (moles/yr x 10^{13})	Source of gas % contribution by abiological process	biological process	
						human	gaia*
Nitrogen	78%	3.6	10^{10}	11	.001	0	>99
Methane	1.5 ppm	6.0	10^{30}	12	0	0	100
Hydrogen	0.5 ppm	4.4	10^{30}	2.2	?	0	?
Nitrous oxide	0.3 ppm	1.4	10^{13}	3.5	.02	0	>99
Carbon monoxide	0.08 ppm	2.7	10^{30}	1.4	.001	10	90
Ammonia	0.01 ppm	8.8	10^{30}	3.8	0	0	100

*gaia = nonanthropogenic biological sources; for details see Table 1.
? = some quantities not known. ppm = parts per million

TABLE 3. Some critical biological elements that may be naturally limiting

Element	Use in biological systems	Possible form of fluid transport
MAJOR ELEMENTS		
C (carbon)	all organic compounds	CO_2; food; organic compounds in solution; biological volatiles; carbonate, bicarbonate, etc.; usually not limiting
N (nitrogen)	all proteins and nucleic acids	N_2, N_2O, NO_3^-, NO_2^- (often limiting)
O, H (oxygen, hydrogen)	H_2O in high concentration for all organisms	rivers, oceans, lakes
S (sulfur)	nearly all proteins (cysteine, methionine, etc.); key coenzymes	dimethyl sulfide; dimethyl sulfoxide, carbonyl sulfide
P (phosphorus)	all nucleic acids; adenosine triphosphate	unknown (biological volatiles? spores? birds? migrating salmon?)
Na, Ca, Mg, K (sodium, calcium, magnesium, potassium)	membrane and macromolecular function	usually not limiting except in certain terrestrial habitats (27)
TRACE ELEMENTS		
I (iodine)	limited to certain animals (e.g., thyroxine)	methyl iodide
Se (selenium)	enzymes of fermenting bacteria (production of ammonia, hydrogen; animals (26))	unknown (dimethyl selenide?)
Mo (molybdenum)	nitrogen fixation enzymes of bacteria & blue green algae; carbon dioxide reductase (*Clostridium*)	unknown

Gaia – the Greek personification of Earth as a goddess. Terra cotta statuette from Tanagra; in the Musee Borely, Marseille. From Encyclopedia Britannica.

Table 2 shows that given the quantity of oxygen in the atmosphere not only the major gases such as nitrogen and methane but also the minor atmospheric components are far more abundant than they ought to be according to equilibrium chemistry. Even though the minor constituents differ greatly in relative abundance, they sustain very large fluxes – comparable to those of the major constituents. The Earth's atmosphere is certainly not at all what one would expect from a planet interpolated between Mars and Venus. It has too little CO_2, too much oxygen, and is too warm. We believe the "Gaia" hypothesis provides the new approach that is needed to account for these deviations.

A new framework for scientific thought is justified if it guarantees new observations and experiments.

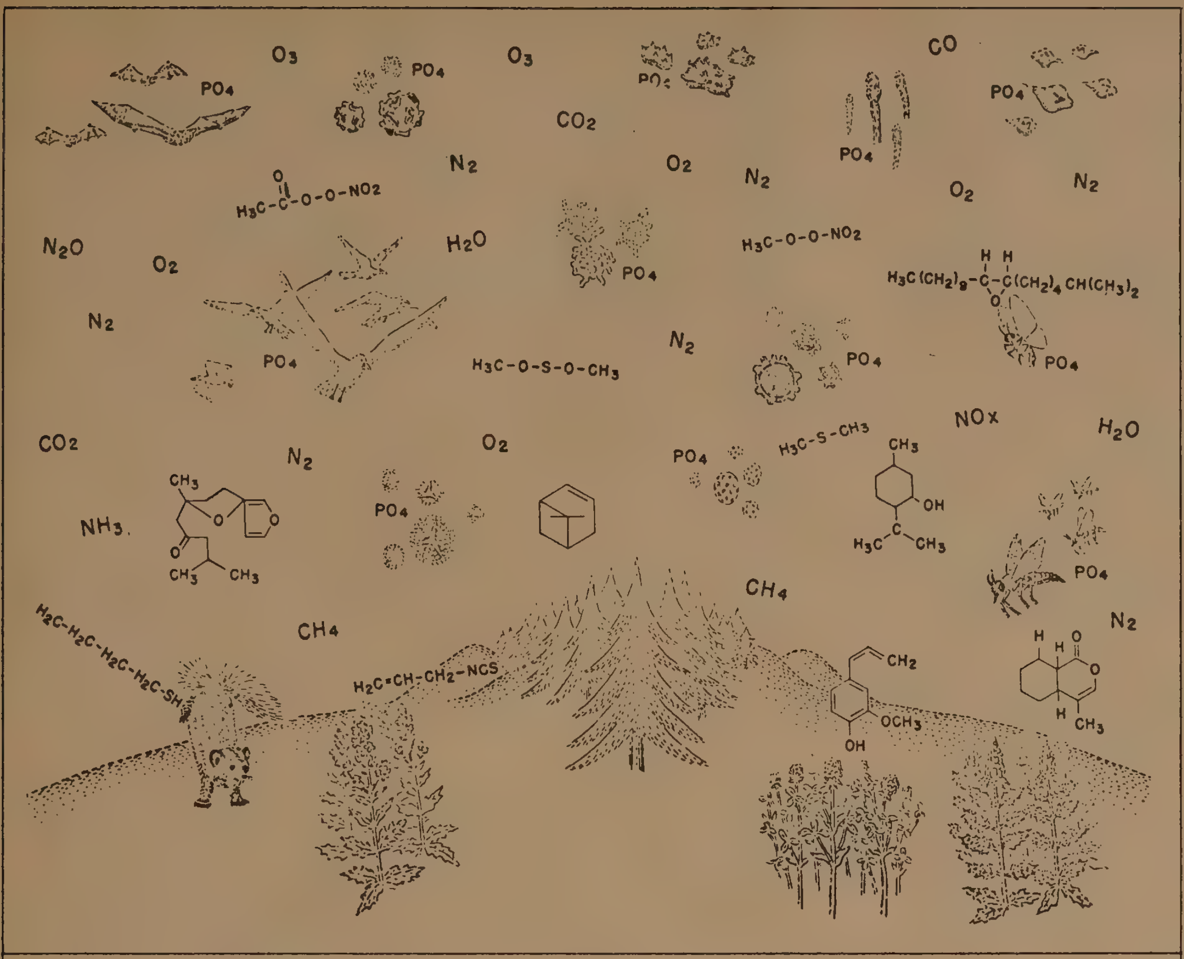


FIGURE 2. Earth's atmosphere at present: examples of major volatiles. (Key: the following compounds and spores are in the picture. It is left to the reader to identify them. See 28 for many details.) Spores of: ferns, club mosses, zygomycetes, ascomycetes, basidiomycetes, slime molds, bacteria. All contain nucleic acids and other organic phosphates, amino acids and so forth. Animal products: butyl mercaptan, plant products: myoporum, catnip (nepetalactone), eugenol, geraniol, pinene, isothiocyanate (mustard); unknown; PAN (paroxacetyl nitrate), dimethyl sulfide, dimethyl sulfoxide; gases: nitrogen, oxygen, methane, carbon monoxide, carbon dioxide, ammonia.

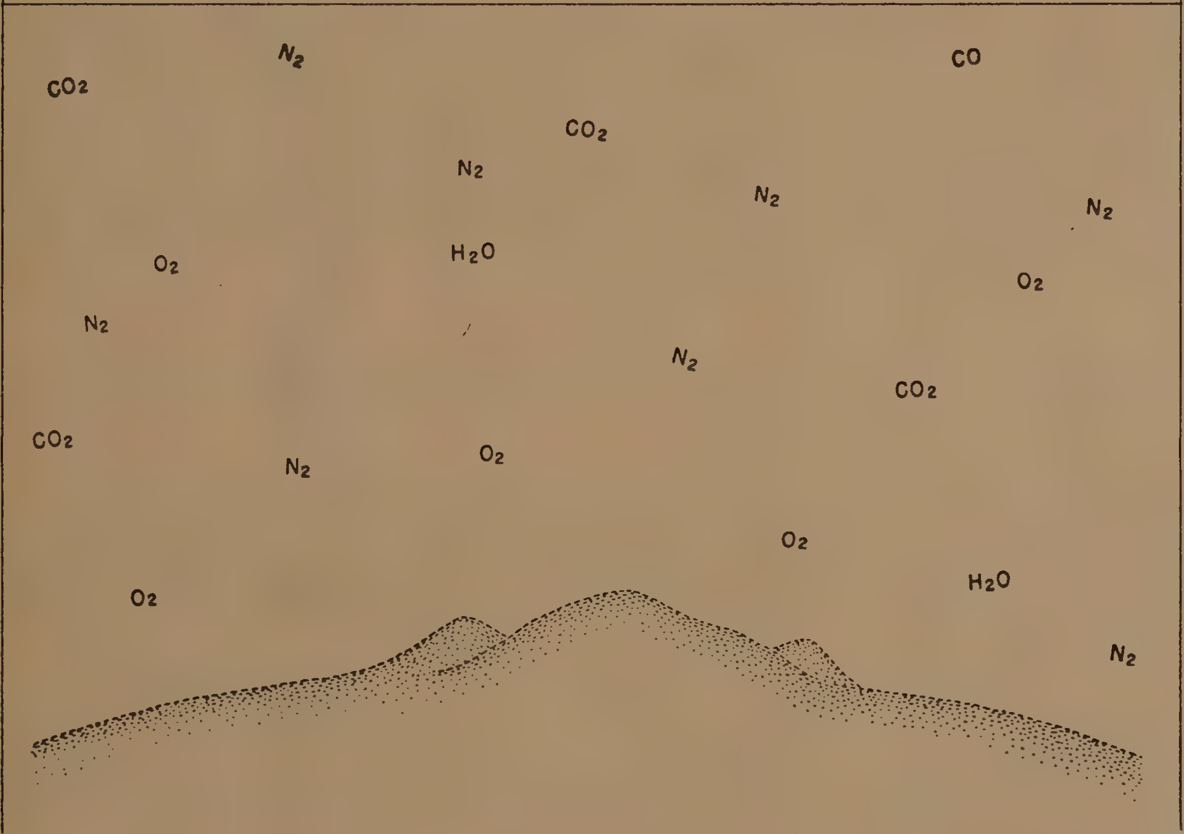


FIGURE 3. The present atmosphere were life deleted. *[Also see CQ cover.]*

The recognition that blood in mammals circulates in a closed, regulated system gave rise to meaningful scientific questions such as: How is blood pH kept constant? By what mechanism is the temperature of mammalian blood regulated around its set point? What is the purpose of bicarbonate ion in the blood? What is the role of fibrinogen? If the blood were simply an inert environment (as the atmosphere is presently viewed) such questions would seem irrelevant and never be asked at all.

Let us consider another analogy. Bees have been known to regulate hive temperatures during midwinter at about 31°C, approximately 59°C above ambient (10). Under threat of desiccation they also maintain high humidities. While the air in the hive is not alive, it maintains an enormous disequilibrium due to the expenditure of energy by the living insects — ultimately of course, solar energy. How is the hive temperature maintained? How does the architecture of the hive aid to reduce desiccation? How does the behavior of the worker bees alter temperature? These are all legitimate scientific questions, generated by the circulatory system concept.

The Gaia hypothesis of the atmosphere as a circulatory system raises comparable and useful scientific questions and suggests experiments that based on the old paradigm would never be asked, for example: How is the pH of the atmosphere kept neutral or slightly alkaline? By what mechanism(s) has the mean midlatitude temperature remained constant (not deviated more than 15°C) for the last 1000 million years? Why are 0.5 x 10^9 tons nitrous oxide (N_2O)

released into the atmosphere by organisms? Why is about 2×10^9 tons of biogenic methane pumped into the atmosphere each year (representing nearly 10% of the total terrestrial photosynthate)? What are the absolute limits on the control mechanisms, i.e., how much perturbation (emanations of sulfur oxides, chlorinated compounds and/or carbon monoxide; alterations in solar luminosity; and so forth) can the atmosphere regulatory system tolerate before all its feedback mechanisms fail?

The Gaia approach to atmospheric homeostasis has also led to a number of observations that otherwise would not have been made, for example, an oceanic search was undertaken for volatile compounds containing elements that are limiting to life on the land, and large quantities of methyl iodide and dimethyl sulfide were in fact observed (11).

> **The atmosphere, therefore, is the mysterious link that connects the animal with the vegetable, the vegetable with the animal kingdom.**
>
> *–Dumas and Boussingault, 1844*

Given the Gaia hypothesis one deduces that all the major biological elements (Table 3) must either be not limiting to organisms (in the sense that they are always readily available in some useful chemical form) or they must be cycled through the fluids on the surface of the earth in time periods that are short relative to geological processes. (Attempts to identify volatile forms of these elements are in progress.) The cycling times must be short because biological growth is based on continual cell division that requires the doubling of cell masses in periods of time that are generally less than months and typically, days or hours. On lifeless planets there is no particular reason to expect this phenomenon of atmospheric cycling, nor on the earth is it expected that gases of elements that do not enter metabolism as either metabolites or poisons will cycle rapidly; (e.g., based on the Gaia hypothesis, nickel, chromium, strontium, rubidium, lithium, barium and titanium will not cycle, but cobalt, vanadium, selenium, molybdenum, iodine and magnesium might (12).) Because biological solutions to problems tend to be varied, redundant, and complex, it is likely that all of the mechanisms of atmospheric homeostasis will involve complex feedback loops [see (8) for discussion.] Since, for example,

Gaia and cybernetics

There is little doubt that living things are elaborate contrivances. Life as a phenomenon might therefore be considered in the context of those applied physical sciences which grew up to explain inventions and contrivances, namely thermodynamics, cybernetics and information theory.

The first cautious approach to a classification of life, reached general agreement as follows 'Life is one member of the class of phenomena which are open or continuous reaction systems able to decrease their entropy at the expense of free energy taken from the environment and subsequently rejected in a degraded form' (Bernal, 1951; Wigner, 1961).

This may also be expressed in the form of the equation of continuity for entropy (Denbigh, 1951).

$$\varrho \frac{dS}{dt} + \mathrm{div}\, S = \theta$$

Where θ is the rate of internal creation of entropy, ϱ the density and S the entropy; div S is the outflow of entropy and $\varrho(dS/dt)$ the rate of change of entropy in the enclosed region; θ must by second law be zero or positive; the possibility that div S can be large and positive makes possible a negative trend for $\varrho(dS/dt)$.

This classification is broad and includes also phenomena such as vortices and flames and many others. Life differs from such primitive processes of the abiological steady state in the singularity, persistence and size of the entropy reduction it sustains. Although limited, this phenomenological description of the class of process, which includes life, is helpful in our search for proof of the existence of Gaia in two ways. Firstly by serving to define the boundary of the internal region where entropy is reduced and secondly by suggesting that the recognition of a living entity can be based upon the extent of its physical and chemical disequilibrium from the background environment.

On the matter of boundaries, it is obvious that a man, as an example of a living entity, takes in free energy in the form of the chemical potential difference between food and oxygen and sustains a low internal entropy through excretion of waste chemicals and heat. To a man, the environment to which entropy is discarded includes the atmosphere and his boundary is therefore his skin. It might seem pointless therefore on Earth to seek the existence of a general living system, Gaia, in terms of entropy reductions within the atmosphere which clearly for some species is a sink for degraded products and energy but this neglects the fact that photosynthetic life uses premium radiation direct from the sun to sustain a high chemical potential gradient within the atmosphere on a planetary scale. For a tree, the boundary within which entropy is reduced is not its surface in contact with the atmosphere but rather the interface between the sun with the

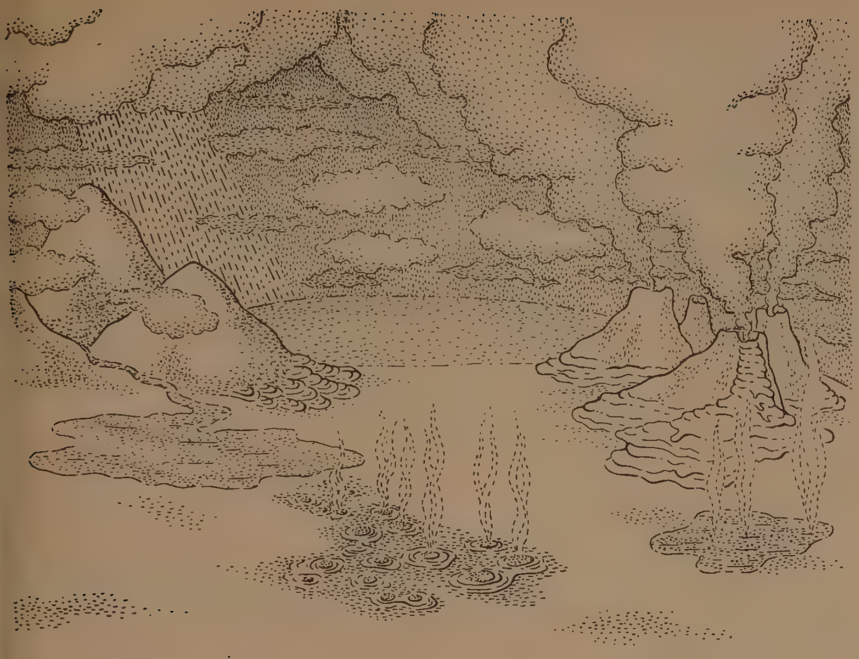


FIGURE 4. Scene from a geothermal area in Fig Tree times (about 3400 million years ago).

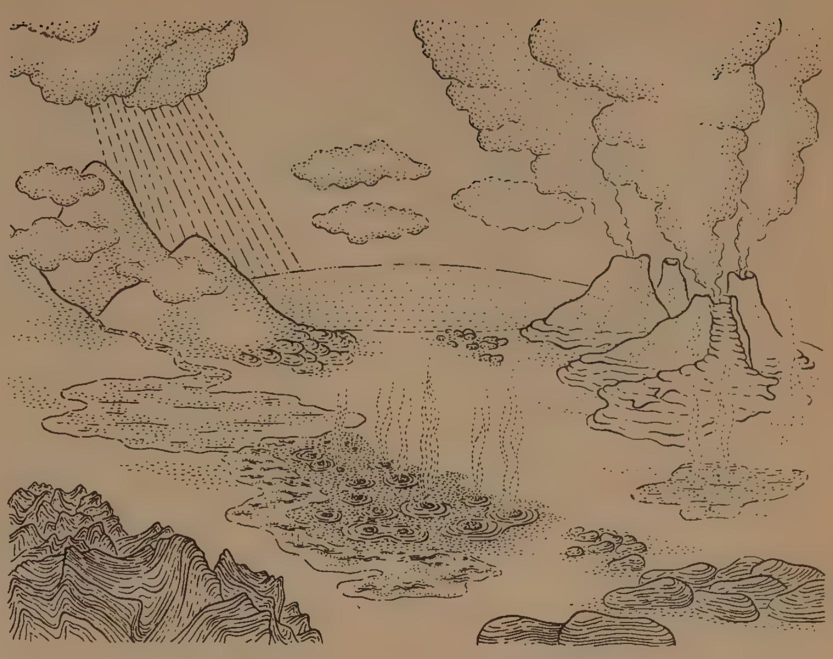


FIGURE 5. Scene from a geothermal area in Gunflint times (about 2000 million years ago). *[Also see CQ cover.]*

no volatile form of phosphorus has ever been found in the atmosphere, and since this element is present in the nucleic acids of all organisms, we are considering the possibility that the volatile form of phosphorus at present is totally "biological particulate." Figures 2 and 3 rather fancifully compare the Earth's atmosphere at present to what it might be if life were suddenly wiped out.

Ironically, it is the past history of the earth with its extensive sedimentary record (fraught, as it is, with uncertainties in interpretation) that might provide the most convincing proof for the existence of continued biological modulation. If one accepts the current theories of stellar evolution, the sun, being a typical star of the main sequence, has substantially increased its output of energy since the earth was formed some

---

atmosphere as an extension of the tree. The tree produces not only food for consumers but also the equally important gas, oxygen, which does not accumulate within the tree waiting to be eaten.

When the whole assembly of life is so seen it is clear that the true boundary is space. The outgoing entropy flux from the Earth indeed from Gaia 'if she exists', is long wavelength infra red radiation to space. This then, is the physical justification for delineating the boundary of life as the outer reaches of the atmosphere. There is also to a lesser extent an inner boundary represented by the interface with those inner parts of the Earth as yet unaffected by surface processes. We may now consider all that is encompassed by the bounds as putative life. Whether or not Gaia is real will depend upon the extent to which the entropy reduction within a compartment such as the atmosphere is recognisably different from the abiological steady state background.

On the matter of recognition a debt is owed to the fertile concept of information theory, Shannon & Weaver (1963). It has been demonstrated, for example, by Evans (1969) that the classical properties, entropy and free energy, have exact information theoretic equivalents. Thus the information (I) of a system can be defined as

$$I = S_0 - S$$

where S_o is the entropy of the components of the system at thermodynamic equilibrium and S the entropy of the system assembled. This relationship can be transferred directly from information theoretic to classical thermodynamic terms as follows:

$$I = (E + PV - TS - \Sigma N, N_i)/T$$

where the right hand side of the equation expresses information in terms of temperature (T), pressure (P), internal energy (E), volume (V), entropy (S), and the chemical potential (N) of the molecules present; it follows that information is a measure of disequilibrium in the classic sense and recognisability in the information theoretic sense.

By examining the extent to which the atmosphere is in chemical and physical disequilibrium both within itself and with the surface of the Earth we have a measure of the extent to which it is recognisable as a separate identity against a neutral background equilibrium state. Whether or not it is seen to be a component part of Gaia will depend upon the size of the disequilibrium revealed.

Excerpted from "Atmospheric Homeostasis by and for the Biosphere: The Gaia Hypothesis", by James Lovelock & Lynn Margulis, Tellus *1974, (1-2).*

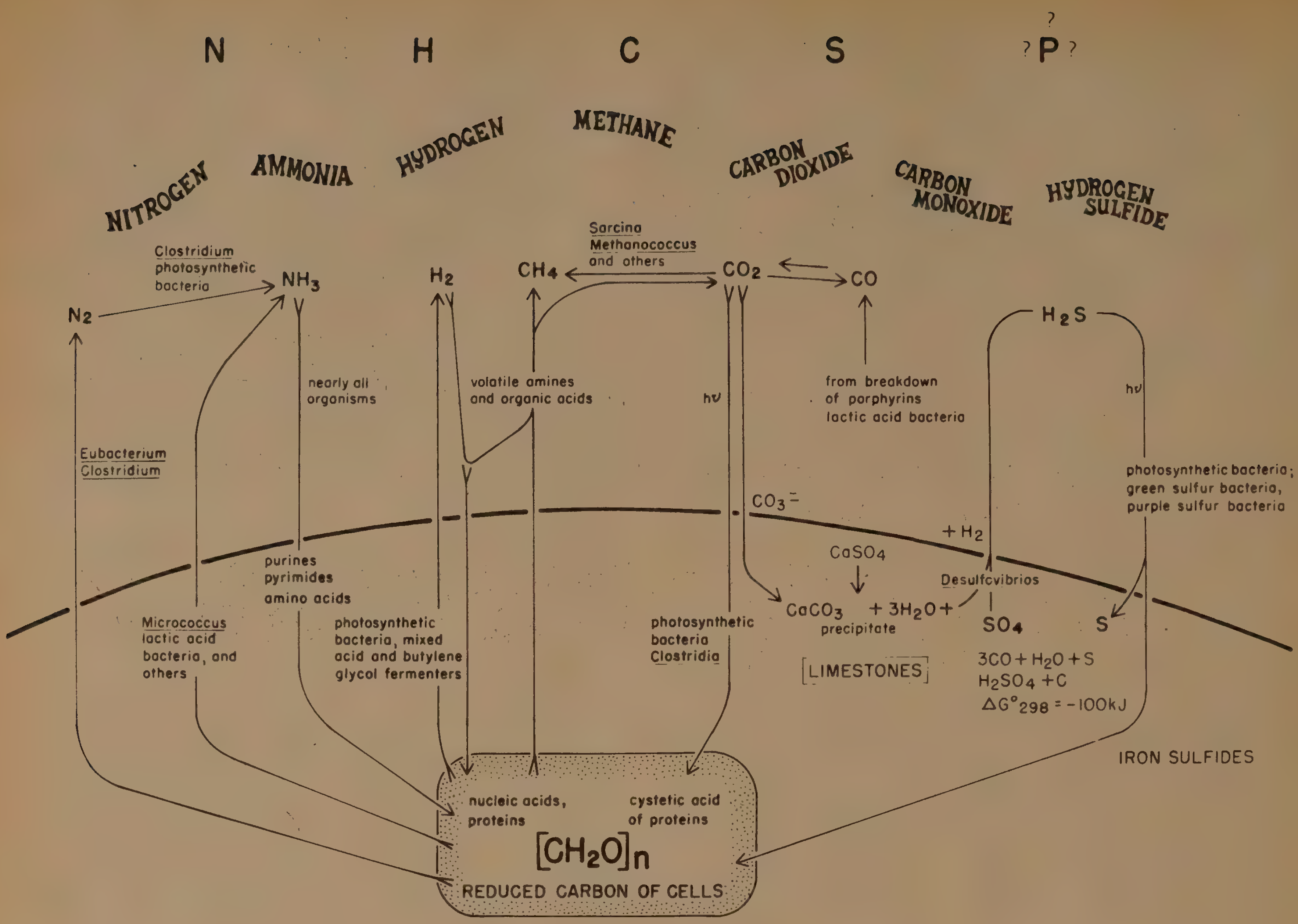


FIGURE 6. A reconstruction of possible anaerobic cycles: 3400 million years ago (genera of microorganisms catalizing the reactions are underlined).

4500 million years ago. Some estimates for the increase in solar luminosity over the past history of the earth are as much as 100%; most astronomers apparently accept an increase of at least 25% over 4.5 billion years (13). Extrapolating from the current atmosphere, given solar radiation output and radiative surface properties of the planet, it can be concluded that until about 2000 million years ago either the atmosphere was different (e.g., contained more ammonia) or the earth was frozen. The most likely hypothesis is that the earth's atmosphere contained up to about one part in 10^5 ammonia, a good infrared absorber (14). Other potential "green house" gases apparently will not compensate for the expected lowered temperature because they do not have the appropriate absorption spectra or are required in far too large quantity to be considered reasonable (14). [There are good arguments for the rapid photodestruction of any atmospheric ammonia (15).] However, it has been argued that ammonia is required for the origin of life (16), and there is good evidence for the presence of fossil microbial life in the earliest sedimentary rocks [3400 million years ago (17).] There is no geological evidence that since the beginning of the earth's stable crust the entire earth has ever frozen solid or that the oceans were volatilized, suggesting that the temperature at the surface has always been maintained between the freezing and the boiling points of water. The fossil record suggests that, from an astronomical point of view, conditions have been moderate enough for organisms to tolerate and the biosphere has been in continuous existence for over 3000 million years (17, 18). At least during the familiar Phanerozoic (the last 600 million years of earth history for which an extensive fossil record is available) one can argue on paleontological grounds alone that through every era the earth has maintained tropical temperatures at some place on the surface and that the composition of the atmosphere, at least with respect to molecular oxygen, could not have deviated markedly. That is, there are no documented cases of any metazoan animals (out of about 2 million species) that can complete their life cycles in the total absence of O_2 (19). All animals are composed of cells that divide by mitosis. The mitotic cell division itself requires O_2 (20). Thus it is highly unlikely that current concentrations of oxygen have fallen much below their present values in some hundreds of millions of years. By implication, oxygen and the gases listed in Table 2 have been maintained at stable atmospheric concentrations for time periods that are very long relative to their residence times. (Residence time is the time it takes for the concentration of gas to fall to 1/e or 37% its value; it may be thought of as "turnover time.") Furthermore, since concentrations of atmospheric oxygen only a few per cent higher than

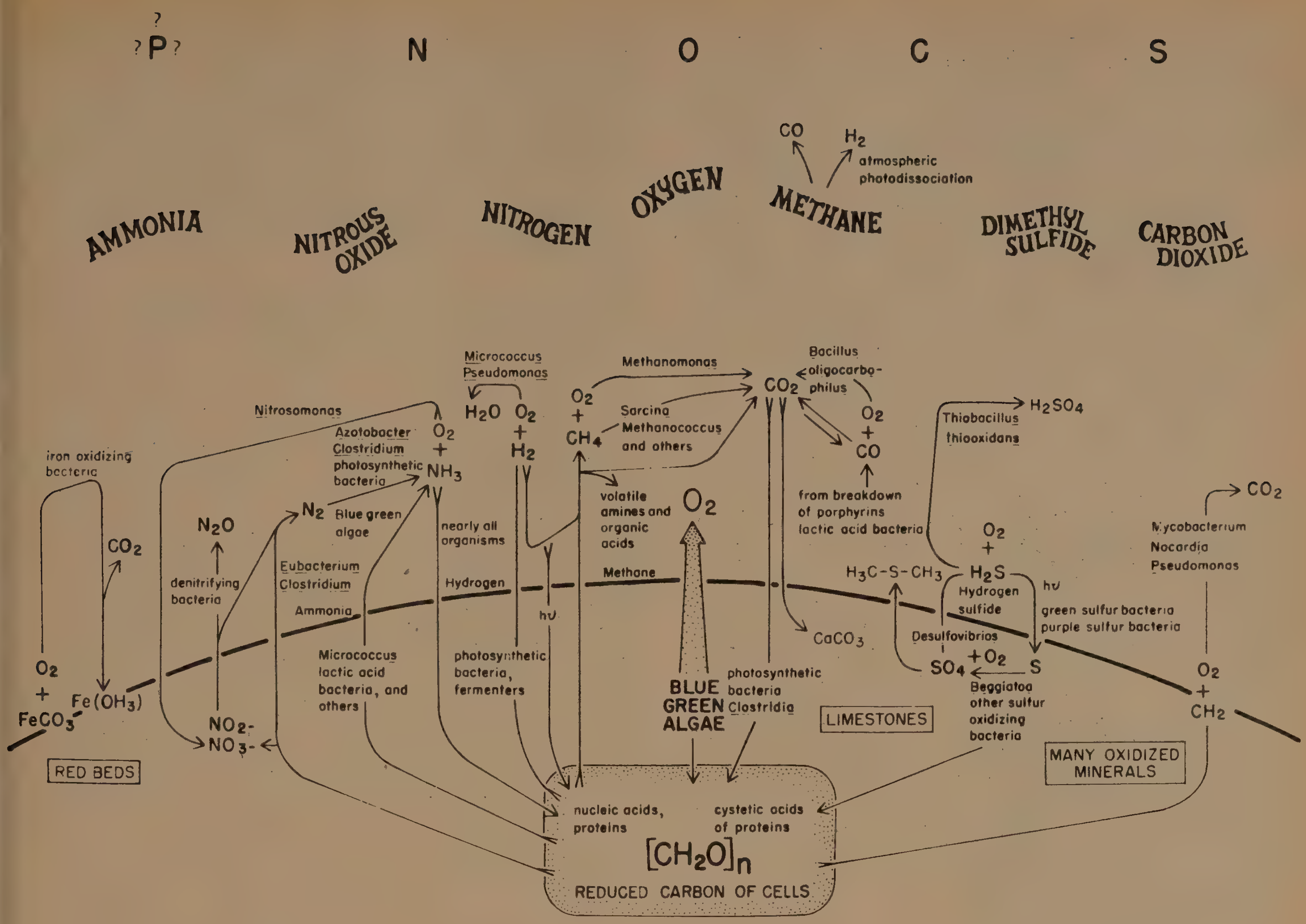


FIGURE 7. A reconstruction of possible microbial aerobic cycles: 2000 million years ago.

ambient lead to spontaneous combustion of organic matter, including grasslands and forests, the most reasonable assumption is that the oxygen value of the atmosphere has remained relatively constant for quite long time periods (21).

How can these observations be consistently reconciled? How can we explain the simultaneous presence of gases that are extremely reactive with each other and unstable with respect to minerals in the crust and at the same time note that their residence times in the atmosphere are very short with respect to sediment forming and mountain building geological processes? In this respect Table 3 can be instructive. For one can see that even though absolute amounts of the gases vary over about 3 orders of magnitude, the fluxes are remarkably similar. These gases are produced and removed primarily by nonhuman biological processes. [See Table 1 and (8).] While the processes involved in atmospheric production and removal of reactive gases are not primarily dependent on human activity, for the most part they are not based on animal or plant processes either [see (8) for a version of the table that lists these.] It is mainly the prokaryote microorganisms that are involved in gas exchange; the rapidly growing and dividing masters of the microbiological world that make up in chemical complexity and metabolic virtuosity what they lack in advanced morphology. These organisms presumably played a similar role in biogeochemical processes in the past as they do today. There is direct fossil evidence for the continued existence of Precambrian microorganisms (17). That they have an ancient history can also be deduced from current studies of their physiology. Among hundreds of species of these prokaryotic microorganisms are many obligate anaerobes, that is, organisms poisoned by oxygen. (All organisms are poisoned by oxygen at concentrations above those to which they are adapted.) Hundreds of others are known that are either microaerophils (adapted to concentrations of oxygen less than ambient) or facultative aerobes (can switch their metabolism from oxygen-requiring to oxygen-nonrequiring).

As a group, the prokaryotic microbes show evidence that the production and release of molecular oxygen into the atmosphere was an extremely important environmental determinant in the evolution of many genera. Prokaryotic microbes (in the form known as the blue green algae, cyanophytes) were almost certainly responsible for the original transition to the oxygen-containing atmosphere about 2000 million years ago (17, 18).

Figures 4 and 5 present scenes before and after the transition to oxidizing atmosphere respectively. Figures 6 and 7 are reconstructions of anaerobic cycles corresponding to Figures 4 and 5, respectively. Figure 4 attempts to reconstruct the scene as it might have looked 3400 million years ago, admittedly in a rather geothermal area. Although no free oxygen (above that produced by photochemical processes and hydrogen loss is available in the atmosphere) the scene is teeming with life — microbial life. For example, entire metabolic processes, as shown in Figure 6, are available within the group of anaerobic prokaryotic microbes today. Since at the higher taxonomic levels (kingdoms and phyla) once successful patterns evolve they tend not to become extinct (22) it is likely that ancestors of present day microbes were available to interact with atmospheric gases very early on the primitive earth. Certainly life was very advanced metabolically by the time the first stromatolitic rocks were deposited. With the evolution of oxygen-releasing metabolism by blue-green algae came the stromatolites. These layered sediments are extremely common, especially in the late Precambrian (23). With the stromatolites comes other Precambrian evidence for the transition to the oxidizing atmosphere sphere. By the middle Precambrian, about 2000 million years ago — the time at which the stromatolites and microfossils become increasingly abundant (24, 25) — the scene might have looked like that in Figure 5. The metabolic processes accompanying that scene are shown in Figure 7. It is obvious that from among metabolic processes in prokaryotic microbes alone there are many that involve the exchange of atmospheric gases. This figure shows how oxygen-handling metabolism was essentially superimposed on an anaerobic world, a concept that is consistent with the observation that reaction with molecular oxygen tends to be the final step in aerobic respiratory processes. All of the processes shown in Figures 6 and 7 are known from current microorganisms (and, by definition, those that haven't become extinct are evolutionarily successful).

The fossil evidence, taken together, suggests that the earth's troposphere has maintained remarkable constancy in the face of several enormous potential perturbations: at least the increase in solar luminosity and the transition to the oxidizing atmosphere. The earth atmosphere maintains chemical disequilibria of many orders of magnitude containing rapidly turning over gases produced in prodigious quantities. The temperature and composition seem to be set at values that are optimal for most of the biosphere. Furthermore the biosphere has many potential methods for altering the temperature and composition of the atmosphere (8). The biosphere has probably had these methods available almost since its inception more than 3000 million years ago. Is it not reasonable to assume that the lower atmosphere is maintained at an optimum by homeostasis and that this maintenance (at the ultimate expense of solar energy, of course) is performed by the party with the vested interest: the biosphere itself? ■

ACKNOWLEDGMENTS

We are grateful to J. R. Williams for excellent editorial aid; to Prof. G. E. Hutchinson, E. S. Barghoorn, H. D. Holland, and J. C. G. Walker for critical suggestions; to Laszlo Meszoly for Figures 2-7 and to NASA NGR22-004-025 for research support.

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Origin of Eukaryotic Cells

It would be difficult to decide whether to place Margulis' book on the shelf next to Kropotkin's **Mutual Aid** *or next to* **Of Molecules and Men** *by Francis Crick. The book is no doubt one of the first statements in a revolution that will rock the Sciences and then the Arts and Social Sciences. Despite the difficulty of microbiological terms and concepts, anyone capable of reading* **Origin of Eukaryotic Cells** *should certainly do so. Sometimes Margulis' prose shines like a black gem:*

"In the late Pre-Cambrian, organisms of all descriptions inhabited the seas and lakes, covered the soil, and formed spores in the air. Some resembled free-living spirochetes, some resembled free-living aerobic eubacteria, and some resembled today's mycoplasms."

In the 19th century when microscopes had been sufficiently developed scientists noticed that the organelles in cells resembled free-living organisms and that the cell seemed to be an assemblage of smaller independent organisms evolved together into a unit.

This view was offensive to the new converts to Darwinism and the insight was swept under the rug. Margulis presents in great detail her compilation of information and research proving that the higher cell — any cell of any creature or multicellular being above microbe level — is indeed a combination of symbiotic partners that have evolved together. She demolishes, with facts, the idea that there is an evolutionary step between the primitive prokaryotic cell and the higher nucleated eukaryotic cell. The most apparent difference between the prokaryotic cell and the eukaryotic cell is the absence of a nucleus in the former and the presence of the nucleus in the latter.

Margulis establishes the separation between the prokaryotic and the eukaryotic cell as the major division of life. This theory replaces the traditional split between plant and animal kingdoms. Animal cells are basically symbiotic associations of three partners evolving together and plants are the same symbiotic cluster, but with the addition of a chlorophyll organism similar to the blue-green algae microbe. Symbiotic associations of prokaryotic cells, in Margulis' assertion, become eukaryotic cells — or are the ancestors of eukaryotic cells.

Our scientists and social scientists have leaned heavily on a crude understanding of Darwin rather than on the subtleties of Darwin's thought. They have seen competition in all things. Margulis' work should force every science to re-examine itself for gross error — such as she has discovered in biology. The social sciences which have always been crudely Darwinistic or Behaviouristic should follow suit — and the same with the Arts. In Margulis' work there is, by inference, a solution to the mechanist/vitalist controversy over the nature of living matter. The simple prokaryotic cell is relatively inert and mechanical. When prokaryotic cells combine in symbiosis there is a "spiritual occasion" and the meat, the cytoplasm of the cell begins to flow — to move with obvious self volition and make complex swirls and streamings. This book is an extraordinary, beautiful new vision for those who can follow it — and a treasure for anyone interested in frontier science.

— Michael McClure

Origin of
Eukaryotic Cells
Lynn Margulis
1970; 299pp.
$17.50 postpaid
from:
Yale University Press
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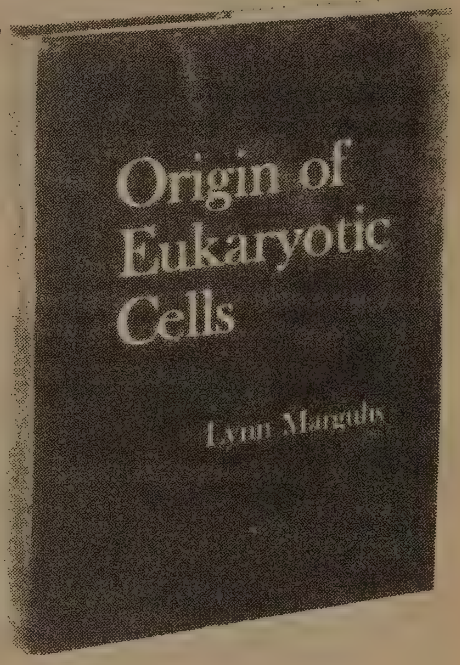
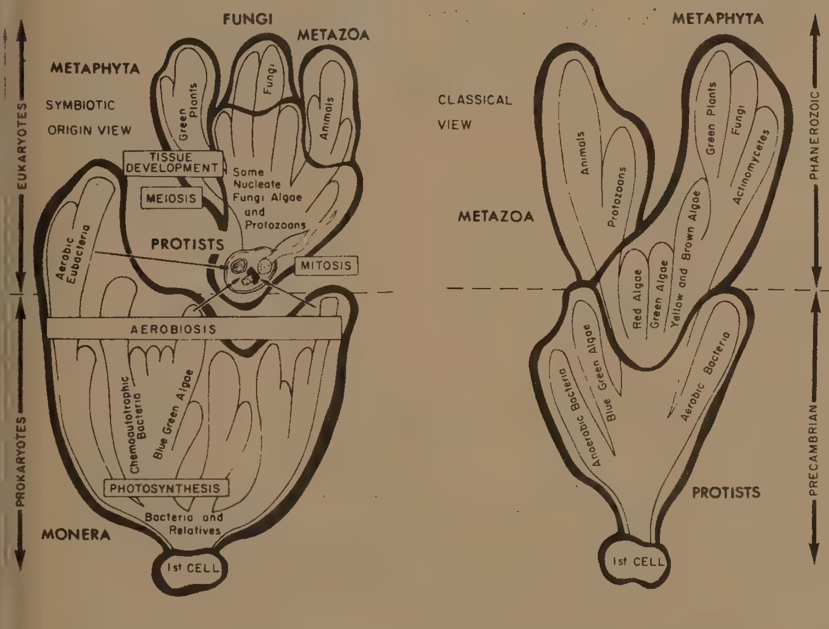
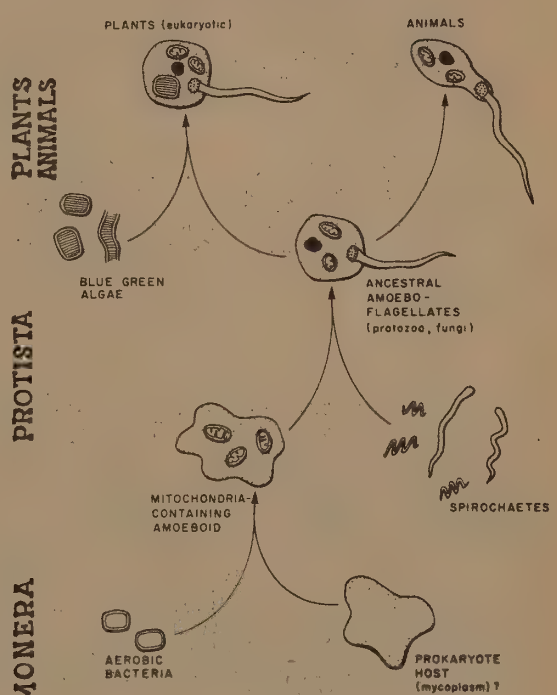
New Haven, CT 06520
or Whole Earth





Comparison between the symbiotic and classical phylogenies of the lower organisms.

Evolution of the eukaryotic cell by serial symbioses


PLANTS (eukaryotic)
ANIMALS
PLANTS
ANIMALS
BLUE GREEN ALGAE
ANCESTRAL AMOEBO-FLAGELLATES (protozoa, fungi)
PROTISTA
MITOCHONDRIA-CONTAINING AMOEBOID
SPIROCHAETES
MONERA
AEROBIC BACTERIA
PROKARYOTE HOST (mycoplasm) ?

As pointed out by Simpson (1967), biology, unlike chemistry and physics, is a historical science.

•

The history of the modern eukaryotic line began when a pleiomorphic microbe, capable only of anaerobic fermentation of glucose to pyruvate, symbiotically harbored a smaller prokaryote. The endosymbiont microbe was an aerobe, a relative of extant aerobic eubacteria, having the biosynthetic ability to form cytochromes and to oxidize all of its foodstuffs completely to CO_2. Flavins, ubiquinone, cytochromes, were intermediate electron carriers in the total oxidation of carbohydrates by the small aerobic symbiont. This association, one of many bizarre and different types, many of which exist today, led to the formation of primitive amoebas. The host became the ground nucleus and cytoplasm, by definition the *protoeukaryote*. It harbored the eubacterial aerobe (by definition, the *protomitochondrion*) that later became mitochondria. From this association amoebas that contained extensive cytoplasmic membrane systems and formed food vacuoles subsequently evolved. Whole-cell predation became common. The aerobic symbiotic bacteria requiring more surface membrane for oxidation-reduction reactions differentiated into the cristae-containing mitochondria of today.

Russell Schweickart exits the Apollo 9 Lunar Module in Earth orbit, March 1969. *"Now you're no longer inside something with a window looking out at a picture, but now you're out there and what you've got around your head is a goldfish bowl and there are no limits here."*

Who's Earth

BY RUSSELL SCHWEICKART

Photos by NASA

> *Like a prayer, like a benediction, Apollo 9 astronaut Russell Schweickart spoke these words last summer before a brainy group meeting on "Planetary Culture" at the spiritual community of Lindisfarne, Long Island.*
>
> *Schweickart himself seemed amazed at what he was saying, amazed at the gathering he was attending, amazed — still — at the events which led him to drift bodily free between Earth and Universe. Remember the starchild at the end of "2001"? Like that.*
>
> *This is just the conclusion of his tape — $6.50 for the cassette from Lindisfarne Association, Box 1395, Southampton, NY 11968.*
>
> *— SB*

Up there you go around every hour and a half, time after time after time. You wake up usually in the mornings. And just the way that the track of your orbits go, you wake up over the Mid-East, over North Africa. As you eat breakfast you look out the window as you're going past and there's the Mediterranean area, and Greece, and Rome, and North Africa, and the Sinai, the whole area. And you realize that in one glance that what you're seeing is what was the whole history of man for years — the cradle of civilization. And you think of all that history that you can imagine, looking at that scene.

And you go around down across North Africa and out over the Indian Ocean, and look up at that great subcontinent of India pointed down toward you as you go past it. And Ceylon off to the side, Burma, Southeast Asia, out over the Philippines, and up across that monstrous Pacific Ocean, vast body of water — you've never realized how big that is before.

And you finally come up across the coast of California and look for those friendly things: Los Angeles, and

Phoenix, and on across El Paso and there's Houston, there's home, and you look and sure enough there's the Astrodome. And you identify with that, you know — it's an attachment.

And down across New Orleans and then looking down to the south and there's the whole peninsula of Florida laid out. And all the hundreds of hours you spent flying across that route, down in the atmosphere, all that is friendly again. And you go out across the Atlantic Ocean and back across Africa.

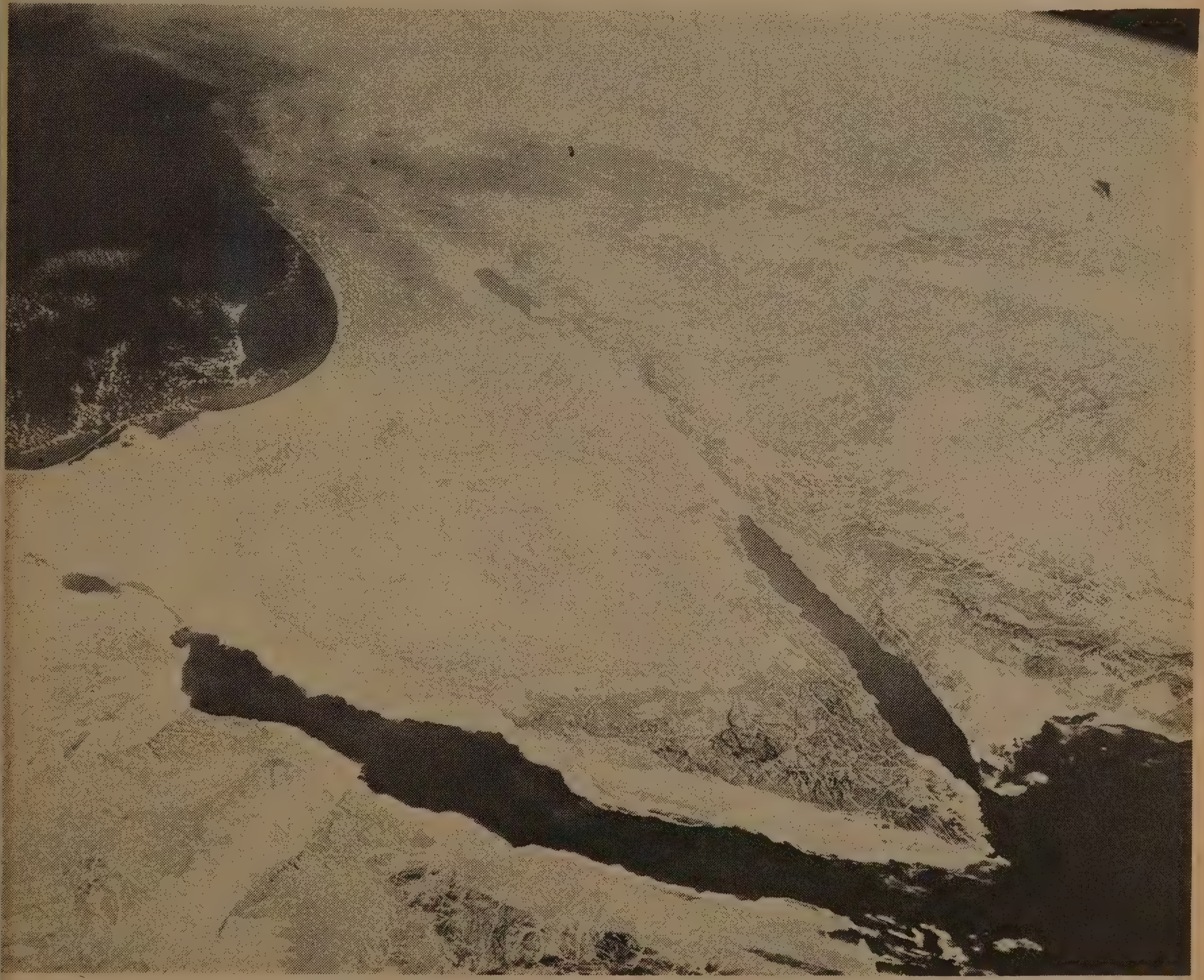
And you do it again and again and again.

And that identity — that you identify with Houston, and then you identify with Los Angeles, and Phoenix and New Orleans and everything. And the next thing you recognize in yourself, is you're identifying with North Africa. You look forward to that, you anticipate it. And there it is. That whole process begins to shift of what it is you identify with. When you go around it in an hour and a half you begin to recognize that your identity is with that whole thing. And that makes a change.

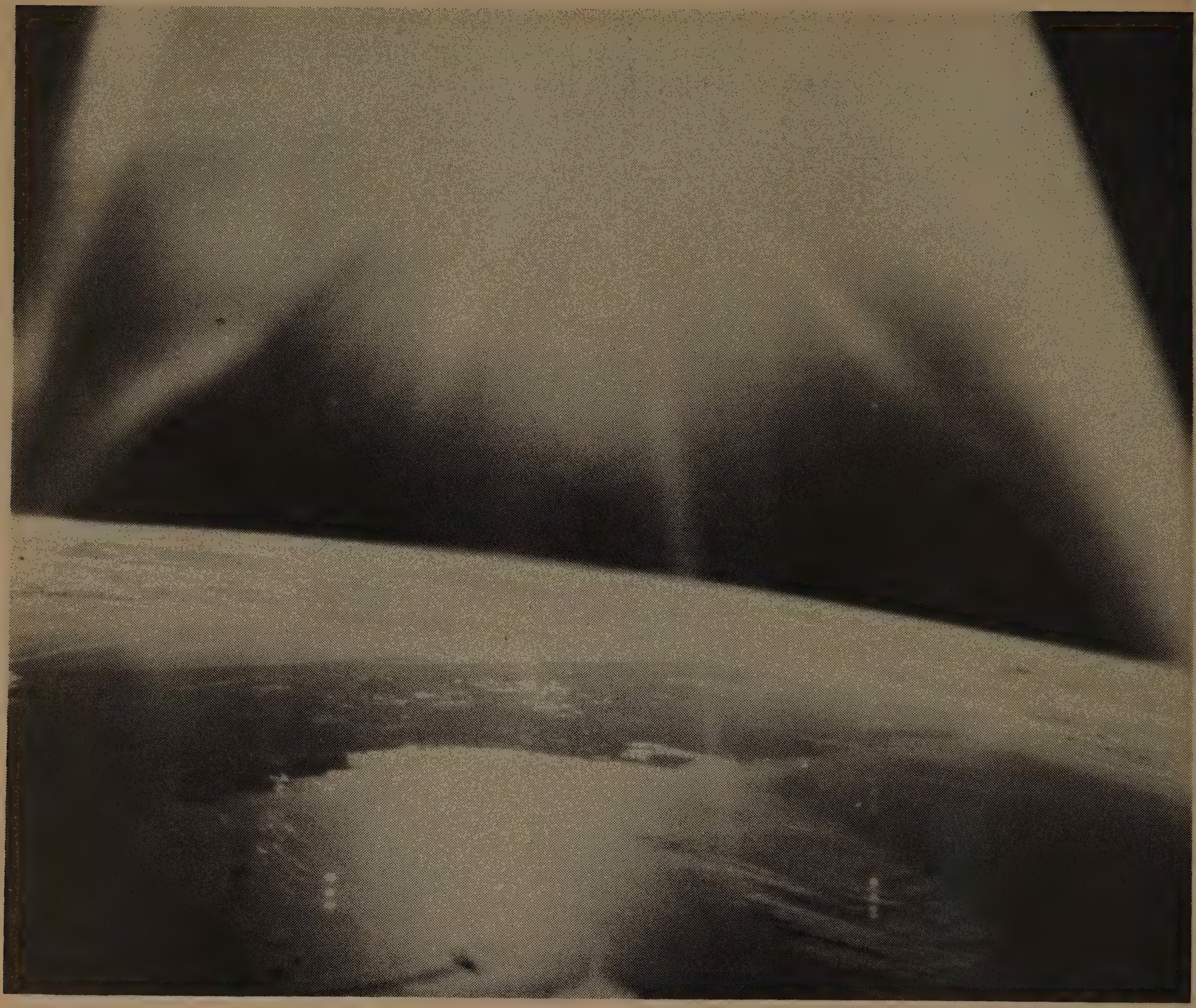
You look down there and you can't imagine how many borders and boundaries you crossed again and again and again. And you don't even see 'em. At that wake-up scene — the Mid-East — you know there are hundreds of people killing each other over some imaginary line that you can't see. From where you see it, the thing is a whole, and it's so beautiful. And you wish you could take one from each side in hand and say, "Look at it from this perspective. Look at that. What's important?"

And so a little later on, your friend, again those same neighbors, another astronaut, the person next to you goes out to the Moon. And now he looks back and he sees the Earth not as something big, where he can see the beautiful details, but he sees the Earth as a small thing out there. And now that contrast between that bright blue and white Christmas tree ornament and that black sky, that infinite universe, really comes through.

[more →]



The Mid-East. *"You realize that in one glance that what you're seeing was the whole history of Man for years — the cradle of civilization . . . You look down there and you can't imagine how many borders and boundaries you've crossed again and again and again. And you don't even see 'em."*



"Then looking down to the south and there's the whole peninsula of Florida laid out. And all the hundreds of hours you spent flying across that route, down in that atmosphere, all that is friendly again."

The size of it, the significance of it – it becomes both things, it becomes so small and so fragile, and such a precious little spot in that universe, that you can block it out with your thumb, and you realize that on that small spot, that little blue and white thing is everything that means anything to you. All of history and music and poetry and art and war and death and birth and love, tears, joy, games, all of it is on that little spot out there that you can cover with your thumb.

And you realize that that perspective . . . that you've changed, that there's something new there. That relationship is no longer what it was. And then you look back on the time when you were outside on that EVA and those few moments that you had the time because the camera malfunctioned, that you had the time to think about what was happening. And you recall staring out there at the spectacle that went before your eyes. Because now you're no longer inside something with a window looking out at a picture, but now you're out there and what you've got around your head is a goldfish bowl and there are no limits here. There are no frames, there are no boundaries. You're really out there, over it, floating, going 25,000 mph, ripping through space, a vacuum, and there's not a sound. There's a silence the depth of which you've never experienced before, and that silence contrasts so markedly with the scenery, with what you're seeing, and the speed with which you know you're going. That contrast, the mix of those two things, really comes through.

And you think about what you're experiencing and why. Do you deserve this? This fantastic experience? Have you earned this in some way? Are you separated out to be touched by God to have some special experience here that other men cannot have? You know the answer to that is No. There's nothing that you've done that deserves that, that earned that. It's not a special thing for you. You know very well at that moment, and it comes through to you so powerfully, that you're the sensing element for man.

You look down and see the surface of that globe that you've lived on all this time and you know all those

Photo by Russell Schweickart of David Scott standing out of the Apollo 9 Command Vehicle. *"There are no frames, there are no boundaries. You're really out there, over it, floating, going 25,000 mph, ripping through space, a vacuum, and there's not a sound."*

people down there. They are like you, they are you, and somehow you represent them when you are up there — a sensing element, that point out on the end, and that's a humbling feeling. It's a feeling that says you have a responsibility. It's not for yourself.

The eye that doesn't see does not do justice to the body. That's why it's there, that's why you're out there. And somehow you recognize that you're a piece of this total life. You're out on that forefront and you have to bring that back, somehow. And that becomes a rather special responsibility. It tells you something about your relationship with this thing we call life. And so that's a change, that's something new.

And when you come back, there's a difference in that world now, there's a difference in that relationship between you and that planet, and you and all those other forms of life on that planet, because you've had that kind of experience. It's a difference, and it's so precious. And all through this I've used the word *you* because it's not me, it's not Dave Scott, it's not Dick Gordon, Pete Conrad, John Glenn, it's you, it's us, it's we, it's life. It's had that experience. And it's not just *my* problem to integrate, it's not my challenge to integrate, my joy to integrate — it's yours, it's everybody's.

I guess that's really about all I'd like to say, except that — and I don't even know why, but to me it means a lot — I'd like to close this with a poem by e. e. cummings that has just become a part of me, somehow out of all this, and I'm not really sure how.

He says, that

> i thank You God for most this amazing
> day: for the leaping greenly spirits of trees
> and a blue true dream of sky; and for everything
> which is natural which is infinite which is yes.

Thank you. ■

Introducing Margalef

STEWART BRAND *introducing . . .*

The article which begins overleaf, "Perspectives in Ecological Theory", comprises about half of a book published in 1968 by the University of Chicago Press (EPILOG p. 462). The author is Ramón Margalef, Professor of Ecology at the University of Barcelona, Spain. He gave the lectures the book is made from in 1966 at Chicago.

Nine years ago. Where were we?

We were talking revolution while he was advancing one.

His revolution goes past the "radical" root of behavior to the perception of behavior, to a cluster of brand-new clarities on the understanding of how systems organize and maintain themselves. When you change perception as he does, you change the world. For instance:

> "Competition . . . is the result of the combination of two parallel negative feedback circuits, from which a positive feedback results." *(Arms race.)*
>
> "Any exchange between two systems of different information content does not result in a partition or equalizing of the information, but increases the difference." *(The rich get rich & the poor get poorer — if they interact they can't help doing so. "Only the poor can help the poor," becomes a cybernetic statement. The wealth we are speaking of runs much deeper than money.)*
>
> "The ecosystem may be considered as a channel which projects information into the future . . . . The structures that endure through time are those most able to influence the future with the least expenditure of energy . . . . A measure of the organization of the ecosystem may be found in the average distance between the place of energy input and the energy sink." *(Here are the beginnings of a formal equation relating energy, information, and time — derived not from the subatomic dream world but from ordinary old pond life.)*

I am drawing a conclusion loudly which Margalef does quietly, that there is an equivalence between biological and social systems. Furthermore I'm convinced that every time we lose sight of that equivalence we get in trouble. Margalef helps convince me, because so many of his statements illuminate human disorders.

Ramón Margalef with his daughters in Barcelona.

Look who's introducing. I'm an editor who was a minor biologist. Peter Warshall is a Utilities Director who was, and remains, a considerable biologist. Michael McClure is a considerable poet whose entire reference is biology. It was Peter and Michael who introduced me to Margalef's book (Michael wrote on the flyleaf, "Absorb all beautiful systems to heighten systemlessness").

PETER WARSHALL *introducing . . .*

When I first read Margalef (1964), I was a newborn earth-land-ecologist. That is, I was surrounded by energy that was all in capsules, in containers: leaves, insects, monkeys, mushrooms. My vision was truly terrestrial. Flows and shifts of energy appeared packaged. Margalef was the opposite. He had water vision — the view from the oceans, estuaries, seas and rivers. His tiny, microscopic plants and animals (plankton) move about in the eddies, tides, currents, migrations, up and down wellings of the ocean. These animals and plants, suspended in water, live without the elaborate shelters of land creatures. They need no armor to protect them from drying out.

This open, less encapsulated life of water creatures, gave Margalef an energy-effusive point of view. In oceans, you can almost "see" absorption of sunlight (as change of sea color) and "feel" the energy shifts as red tides roll in or lakes turn upside down. Margalef's first great teaching was: "see the land from inside the water." This is how living creatures first experienced the planet.

Margalef's perspective on structure (especially water-preserving structures like tree bark) freed him to talk very clearly on the subject of energy, biomass, and evolution. In his usual didactic but crystalline sentences, he explained (1964) how prehistoric salmons began the modern salmons of today. To paraphrase: early salmonoids probably lived near estuaries. They laid their eggs in fresh water streams near the ocean *(like many fish) and took advantage of the stream community, its fast moving water and large volumes of free (not encapsulated) oxygen and nutrients. Here, little eggs could grow fast into little salmonoids. These little fish then drifted to the river-mouth. As "fingerlings" they needed and found larger chunks of encapsulated energy. The rich river mouth and then the deep ocean were communities with larger, packaged, energy chunks and more variety of food. So, it goes. Salmonoids that utilized the free, quick, high-powered stream energy as young and the more structured, pre-packaged energy of the ocean when older, evolved to today's salmon. Two energy locales of very different qualities, created the fabric for the salmon, to evolve spectacular migration patterns, very very specialized knowledge and internal maps.*

It is this kind of "energy-field" musing, so new to the naturalist, so natural to the peyote eater, that marks Margalef's second great contribution to my life.

Notice how the salmon's evolution was, to a large extent, the acquisition of know-how: stream to ocean, ocean to stream. Only recently, the salmon's great gourmet memory of streams of their birth has been discovered. Young salmon memorize (in some manner) the odor-taste trail specific to the rivulet of their birth. This information is retained during their oceanic life (two to seven years). If a river is polluted, returning salmon become confused at the point of pollution. Anyway, Margalef's third contribution was to begin to place ENERGY and INFORMATION into the same BIG PICTURE.

* * *

Margalef's prose is didactic and his vocabulary abstruse. This will be the breaking point for many readers. Some of this newness is aquatic-speak vs. land-speak:

> **"Under certain conditions, regression from a filamentous or a sessile stage to free-swimming forms, as in *Prasinocladus,* may be considered neoteny."**

But Margalef has a tendency to make natural communities appear more complicated than they are. His ecosystems "follow a directed change" or "seek to" bring about order, reduce entropy, increase information. This process is self-determining and self-regulating (by feedback). "Information" is maximized by increased kinds of species, more organic molecules, more complex vertical structure (among other things). All this, to me, is simply saying:

— you start from nothing
— the sun is above
— gravity "pulls" downward.

I mean, since a human scientist decided that his starting point was barren ground or water, succession can only make more biomass later (barring fires, farmers, pollution and war). Plants that utilize sunlight to make food, grow up. Leaves are on the tops of trees, green algae on the tops of lakes. When plants and animals die, they go down. To recycle what's "down," trees have roots and tubes (in the trunk) that return nutrients to the growing leaves. Most lakes circulate water and nutrients by eddies or migration upward. If you can say SUN & GRAVITY, why say MAXIMIZE NEGENTROPY or some such.

When reading Margalef, I prefer to trip out on a sentence ("in changing environments or in poorly organized systems, maintenance of the *[information]* channel is more expensive . . ." *or* "dead wood . . . is no longer living matter, but it is tremendously important as a structural element . . ."*). I now read him for the flash and not the Total Theory (THE SYSTEM). He allows a "collective consciousness" of planet parts to move around so gracefully.*

MICHAEL McCLURE introducing . . .

Gary Snyder brought a marvelous book — **Perspectives in Ecological Theory** *by Ramón Margalef — to a conference on the rights of forests, rivers, and non-human species.*

I found it to be a natural leap to go from Odum's **Environment, Power and Society** *— or from readings such as Paul Martin's* **Pleistocene Extinctions** *— to Margalef's vision.*

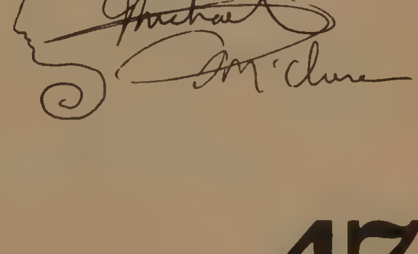
We expand our universes of perception by an unlimited number of modes: through the observation of wildflowers, or through yogic meditation, or by watching the sunset through a rabbit's eyes, or by letting our consciousness fall on the art nouveau patterns of a butterfly. As we observe more and more, the interstices between men's thoughts fill with perception. There is a development of discriminations of the physical world. These discriminations reward one with their refinement.

Some men directly reflect nature with the grace of their thoughts. Margalef's thought is like that but not always easy to share. The natural world — like our bodies — is not necessarily as we imagine it to be.

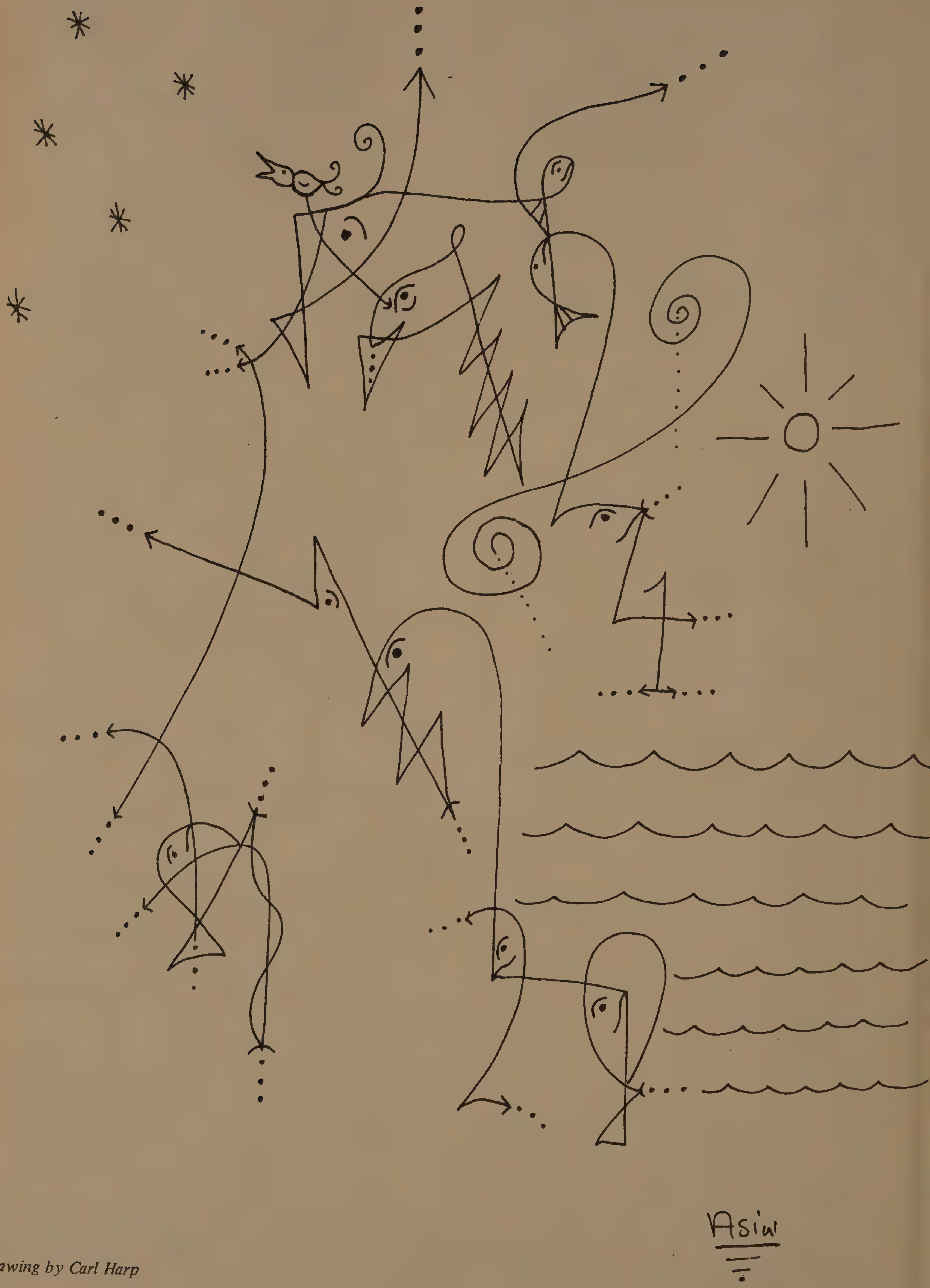
Margalef's insights into "energy gates" and "ecotone" are thrilling. In reading them, each large conceptual step was an expansion into a new language — into incisive calligrams.

I am concerned that we who feel intensely could lose the ability to appreciate the elegance of physical thought. The thinking of Lynn Margulis — with her theory of the symbiotic origin of higher life, or Lorca — a great imagination given shape in poetry, or Bruce Conner — with his meditative drawings and films, all make the kind of contribution that Margalef does.

Margalef helps me be a mammal patriot through his realization of the spiralling inter-relationship of evolution and succession. It is a gift of a wider horizon for my eyes.



Michael McClure



Drawing by Carl Harp

PERSPECTIVES IN ECOLOGICAL THEORY

BY RAMÓN MARGALEF

THE ECOSYSTEM AS A CYBERNETIC SYSTEM

CYBERNETICS

Cybernetics concerns itself with control and communication in systems formed by living organisms and their artifacts. The word was introduced by Norbert Wiener at the time of the Second World War, resurrecting and giving new meaning to the Greek word for 'helmsman' (Wiener 1948). So much popular prestige has been attached to cybernetics that when the title of a talk is "Ecology and Cybernetics," the catchword, at least in some countries, is 'cybernetics', just as when the title of a talk is "Biology and Exobiology," exobiology is likely to draw more attention (and surely more money!) than biology. This analogy is not put forward as a malicious intimation that cybernetics is something as nearly nonexistent as exobiology, but only as a reminder that the emphasis has to be placed on the solid foundation, that is, on ecology.

Cybernetics must be considered as simply another possible way to look at things. Whether interest in cybernetics is passing or lasting depends upon whether it adds something new and valuable to the framework of general ecology. Every fashion that goes through the scientific world should leave something of value. The points of view emphasized by cybernetics are, indeed, useful in different aspects of ecology. The books of Ashby (1954, 1956), for instance, contain many stimulating suggestions of interest to the ecologist, and not only in the areas specifically discussed here.

Cybernetics refers to systems. Every system is a set of different elements or compartments or units, any one of which can exist in many different states, such that the selection of a state is influenced by the states of the other components of the system. Elements linked by reciprocal influences constitute a *feedback loop.* The loop may be *negative,* or *stabilizing,* like the one formed by a heating unit and a thermostat or the mechanisms regulating sugar level in the blood. Or the loop may be *positive,* or *disruptive,* like the spread of an annihilating epidemic.

A characteristic of negative feedback is that not only the entire system but also some selected states of the system show a considerable persistence through time. A cybernetic system influences the future, or bridges time, in the sense that the present state sets limits or patterns for future states. Thus, the present state is a bearer of information. Here we meet the word 'information' used in the context of cybernetics. Information has to do with any a posteriori restrictions of a priori probabilities. Any cybernetic system, through the interactions of its parts, restricts the immensely large numbers of a priori possible states and, in consequence, carries information. Communication or information theory is closely related to cybernetics, and may even be the same — but semantic questions do not interest us at present.

Information contained in nature — why nature is as it is and not otherwise — allows us a partial reconstruction of the past. Only a hypothetical universe composed of pure energy would be without a past. In any material system interactions and cybernetic mechanisms appear, and with them stores of information. Organisms constitute a wonderful example, but this process of history-making and history-telling is by no means restricted to the organic world. The development of the meanders in a river, the increasing complexity of the earth's crust through successive epochs of orogenesis, are information-storing devices in the same manner that genetic systems are. Moreover, all such cybernetic systems are naturally self-organizing systems. Information is expressed by a mechanism, and storing information means increasing the complexity of the mechanism. The success of life springs from miniaturization. It depends on the packing, in a small space, of a prodigious number of overlapping mechanisms, wonderfully persistent by virtue of built-in regulatory circuits and sufficiently open to carry into the future a promise of new developments.

Machines are ordinarily assembled with some finality in the mind of the constructor or designer. A machine without finality is merely an objet d'art. Organisms are objets d'art only outside their environments. In cybernetic systems that occur naturally, whether the meanders of a river or organisms, the only test to pass is the ability to remain. Finality is automatically equated with persistence, and persistence is more apparent if the external form is preserved through time. Thus, conservatism seems to be a law of nature, and systems endowed with the highest stability of form — no new properties being added that are not accounted for — may be rightly considered the best channels for information. Often, of course, the preservation of a form or a state reflects simply the unavailability of the energy necessary for a change. In any case, however, it can be deduced from general cybernetic theory that any system that can adopt different states automatically remains in, or after a time adopts, the most stable of them. It is probably unnecessary to add that we have here the basis for a welcome enlargement of the theory of natural selection.

[more →]

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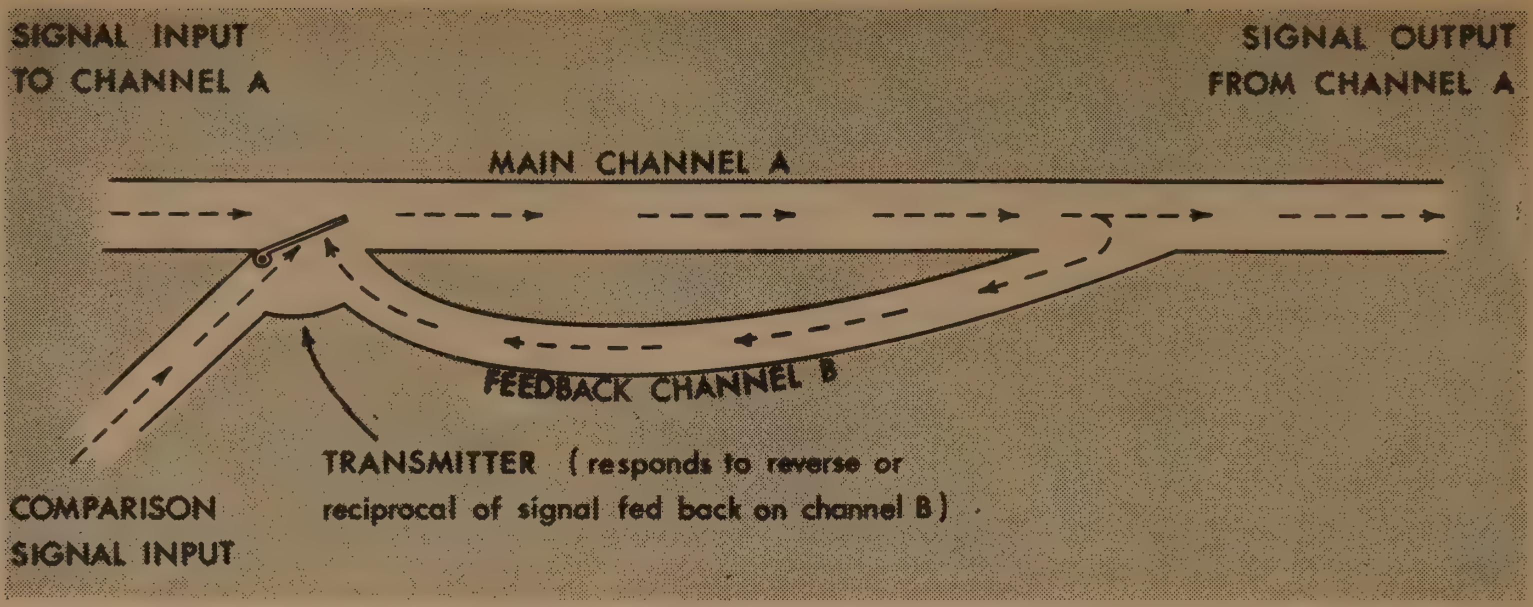
SIGNAL INPUT TO CHANNEL A
SIGNAL OUTPUT FROM CHANNEL A
MAIN CHANNEL A
FEEDBACK CHANNEL B
TRANSMITTER (responds to reverse or reciprocal of signal fed back on channel B)
COMPARISON SIGNAL INPUT

Negative Feedback – from James G. Miller, "The Nature of Living Systems", The Quarterly Review of Biology, *March 1973*

ENERGY AND ENERGY GATES

Perhaps the adoption of a cybernetic point of view can help to emphasize a very important and often neglected point. The two elements which are linked in a feedback loop are not equivalent; there is a basic asymmetry between them. To put it in a nutshell, when a predator kills and eats prey, the prey retains no memory of the event, but the predator receives the energy and is satisfied. One of the elements gives a surplus of energy, and the other uses a small part of such energy to maintain a more stable internal state. In other words, each interaction represented by an intersection in *[the expressions in the footnote]* is a node of energy transfer, or, more precisely, a *gate* for energy. And as energy flows, some information — redundant information, it is to be hoped — is destroyed . . . .

An organism with a high fecundity b and a high mortality m may be compared to a thermostat that uses a good deal of thermal energy to work as a regulator. Of course, it is more expensive to operate and it is a poorer regulator because it tends to produce strong fluctuations. The only positive quality of such a piece of equipment would be its ability to work under a wider range of conditions: it would be expected to be rather rugged and resistant to external fluctuations.

Ecologists using the equations of Lotka (1956) and Volterra (1926) have not emphasized their asymmetry, probably because they accepted that asymmetry as trivial. The energetic asymmetry is worth further consideration, however, because it is possible to associate some notions related to entropy with the action of such energy gates. Entropy production should be greater if the transfer of energy is higher. Moreover, some information is destroyed in the functioning of the energy gates, at least in the form of the organization and memory of the prey that are killed.

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STABILITY

The concept of stability is often involved in discussions of our subject. As implied in the model of expressions (footnote), the changes in any system through time should be in the direction of increasing constancy in numbers. This constancy may be called stability. It is stability that is the consequence of interactions inside the system. But stability as it is commonly used in ecology has something to do with exogenous variations of the parameters, such as E, N_1, N_2, . . ., through agents outside the system. If such parameters change often (climatic changes, destruction of organisms by unforeseen agents, and so on), then the term stability is frequently used to designate the ability of the system to remain reasonably similar to itself in spite of such changes. Here belongs MacArthur's concept of stability (MacArthur 1955), which presupposes the existence of alternative pathways for energy flow, chosen according to the imposition of external circumstances. These concepts of stability are quite different, and ecologists vacillate between them or are confused by them. To avoid confusion, without complicating the ecological vocabulary it is possible to say directly that in the

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FOOTNOTE

A simple example of an elementary cybernetic mechanism, in the form of a negative feedback loop, is the classical one of a predator and its prey. Organisms are the bearers of huge amounts of information. Since they can be destroyed but cannot be produced from nothing, any regulatory mechanism implies an initial overshoot. An excessive number of offspring is produced by the prey. This number is reduced to a lower level through destruction by the predator. Such destruction is density-dependent, because the numbers of the predators themselves are dependent on the numbers of the prey at a previous time. The interactions between species can be considered cybernetic mechanisms. Their goal can be stated, for our own special and descriptive purposes, as the maintenance of a reasonable constancy in numbers. Such constancy in numbers means the preservation of information, inasmuch as future states of the system become more predictable from the present situation.

Although such points of view are not common to all ecologists, they may be considered implicit in ecologists' usual way of dealing with these questions, following the lead of Volterra, Lotka, and possible, if less well-known, forerunners. The way in which these authors present their theories can be summarized by writing the rate of change, dN_i/dt, of the number of individuals, N_i, of any species, and the rate of change, dE/dt, of the intensity of selected environmental factors, E, as proportional to a sum of products representing various interactions. An example might be the set of differential equations:

$$\begin{array}{rcllll} & & E & N_1 & N_2 & N_3 \\ \hline dE/dt & = & & -aEN_1 & -bEN_2 & \\ dN_1/dt & = & +eEN_1 & -fN_1^2 & -qN_1N_2 & -hN_1N_3 \\ dN_2/dt & = & & +iN_1N_2 & -jN_2^2 & -kN_2N_3 \\ dN_3/dt & = & & +lN_1N_3 & -mN_2N_3 & -nN_3^2 \end{array}$$

Although some attention has been given to the implications of similar groups of equations, ecologists have not gone very far in discussing such a model. It is true that nobody has been able to write down an expression in reasonably accurate terms, but this is an argument for passing from a 'microscopic' to a 'macroscopic' approach, as will be discussed later, and some speculative considerations on the perspectives of such a formulation are not out of place here.

first case the system is achieving a steady state under constant conditions; in the second case, however, the system has a greater resistance to changes that are external to the system in their origin. The latter resistance is paid for through a higher energy flow and a small number of interacting elements, rather unspecialized in their reciprocal interactions . . . .

Let us put this again in the language of information theory. In the first kind of stability, the next state of the system is predictable from within the system, the system contains much information, and new events add small amounts of information. In the second case, the future is less predictable, the system contains less information, and each event represents a relatively important source of information. It is important to remember that a price must be paid for the acquisition of new information. Thus stability in the face of external fluctuation is more expensive than steady state stability.

But, after all, perhaps it is not necessary to use the word 'stability'. Leigh (1965) speaks only of the 'frequency of fluctuations' as a good operative definition of what he has in mind. It is important that the frequency of fluctuations is related to a term in which the ratio production/biomass stands prominently as a factor. The 'frequency of fluctuations' is higher when this ratio is high so that the 'frequency of fluctuations' is related to the inverse of stability in the first (steady state) sense.

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DIVISIBILITY OF ECOSYSTEMS

Organization of ecosystems in space is closely linked to the gradients across asymmetric boundaries or to the very existence of such boundaries. It is worthwhile to add some considerations that will help us become aware of the importance of the spatial extension of ecosystems. An ecosystem can be considered as the material path followed by energy that generally enters in the form of photons and goes out into an energy sink. A very simple model of an ecosystem would be formed by some fluorescent substance in which incident photons drive electrons out of their initial orbits. Later the electrons fall back into the lower energy orbits and light of some wavelength is produced. As an example of a real ecosystem with a similarly low degree of organization, we may choose a pelagic ecosystem in turbulent water. The average distance between producers and consumers is small and evenly distributed, and the energy that enters the system by photosynthesis is dissipated in a short time and in a limited space. In other words, the average path of energy-bearing organic molecules is only a few centimeters long, and the cycle of the elements is completed in the same dimensional scale.

In more stable and stratified water, diffusion and mixing are less in the vertical direction than in the horizontal, and the gradient in light and energy input is decisive. The center of gravity of the vertical distribution of animals lies deeper than the center of the distribution of plants, and bacteria are distributed, on the average, still deeper. Here, the average distance between the point at which photons energize some element of the system and the point at which such an element leaves the organisms is of the order of several meters. The longer average trajectories followed by atoms of the different elements in their cycles is reflected in a slowing down of the respective cycles. The ecosystem has grown in space.

An ecosystem, like any persistent structure, has some properties in common with the solid state, expressed in the ability to construct mechanisms. The comparison between a gas and a machine made of solid parts may be helpful. A force applied to a gas transmits movements to its molecules; the small eddies represent a kind of structure, because there is a certain order and some predictability associated with them. But it is a very low degree of organization as far as transportation of energy goes: energy promotes a disorderly movement of molecules and is lost as heat. In a mechanism composed of rigid levers, however, heat appears only at the limits of the solid structures where there is friction, and only here can we find a similarity to the behavior of a gas. But the molecules of a rigid body have limited freedom. They move in an orderly fashion, impelled by energy associated with a structure that does not decay through time. In a mechanism made of rigid parts, energy is transferred between distant points in a thermodynamically cheap way.

Some Definitions

by Peter Warshall

AQUATIC TERMS

Benthos: aquatic communities of animals and plants fixed to the bottom.

Eutrophication: This is the natural ageing process of lakes and lagoons. It usually means a change from lake to marsh.

Pelagic: life on the open sea, includes plankton.

Plankton: animals or plants that float in the open sea (not attached). Typical plant plankton (called phytoplankton) are algae.

THEORY TERMS

Biomass: a collective term, traditionally meaning living weight. Instead of saying there are 10 pigs, pig farmers say 4,000 pounds of "live weight." This is biomass. Margalef's definition would like to incorporate "dead weight" like tree stumps. He expands the definition towards "organized molecules."

Primary productivity: the rate at which radiant energy from the sun is stored by green plants (and a few others) in the form of organic substances which can be used as food. It is usually measured as the mass accumulated or the calories accumulated for a period of time.

Trophic level: *trophe* = nourishment. This is one way to look at a natural community. Usual styles of nourishment (trophic levels) are self-nourishment (plants that fix light), herbivores (animals that eat plants), and carnivores. There are many other styles of nourishment.

Entropy: this is part of current thermodynamic theory. "Entropy" measures the amount of disorder and the amount of unavailable energy. "Negentropy" is a measure of how organized a natural community is, how much it is "structured," how much energy is "trapped" for use. Both entropy and neg-entropy are closely related to "information" and "biomass" — especially in Margalef's thinking. For instance, as a community becomes more organized (more old trees, fewer weeds) more of the energy is tied up in wood. By growing (working), more organization has come about. Margalef would say that biomass, information content, order and negentropy have increased. Order has been achieved by pumping out disorder. This is a community of low entropy.

Now, it is my point that ecosystems behave rather more like solid mechanisms than like gases, in the same sense that ecosystems transmit energy long distances, organize space, and, in doing so, influence future events. As a corollary, a measure of the organization of the ecosystem may be found in the

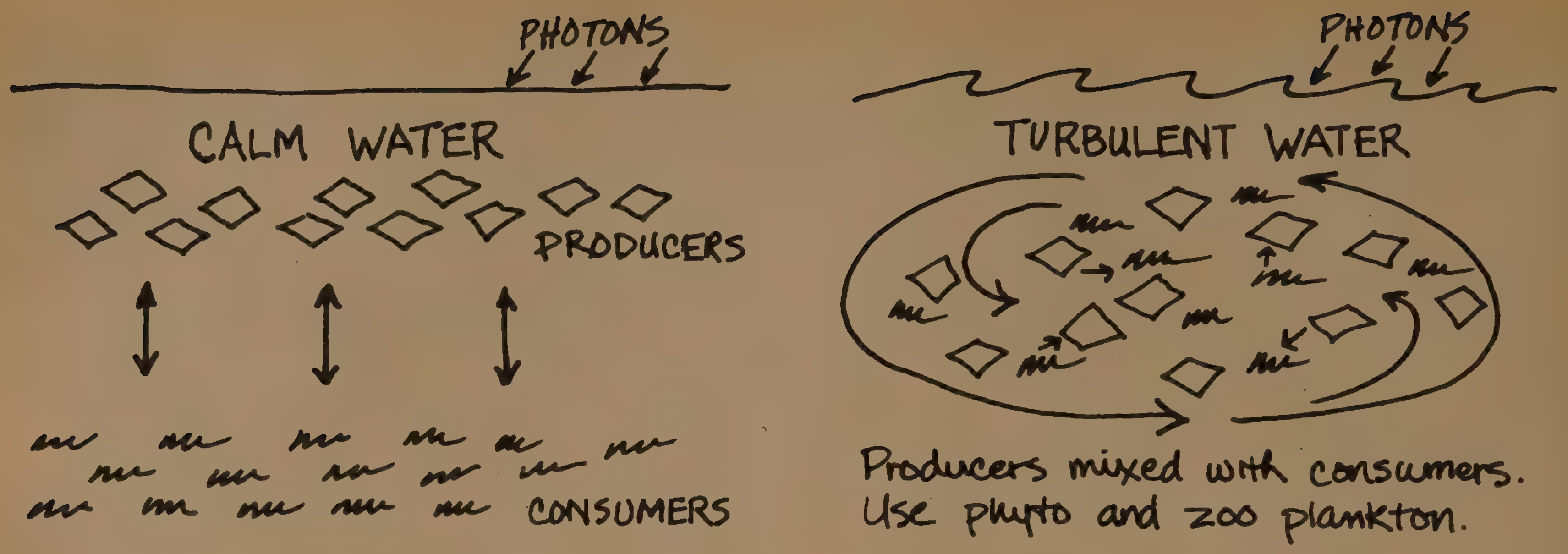

Diagram by Peter Warshall and Carol Kramer

average distance between the place of energy input and the energy sink. The distance can probably be measured either in terms of space or of time; in other words, a system maintaining a very slow cycle over a short distance may be equivalent in terms of organization and of influence on the future with a system running faster but embracing in its cycle a larger space.

Perhaps, in the depths of his psyche, the ecologist may be grateful to cybernetics for throwing a tenuous mantel of respectability over the discredited method of reasoning by analogy. Further steps along the same path now seem justified.

A BASIC PRINCIPLE OF ORGANIZATION

Everywhere in nature we can draw arbitrary surfaces and arbitrarily declare them boundaries separating two subsystems. More often than not it turns out that such boundaries are asymmetric; they separate two subsystems that, although arbitrarily limited, are different in their degrees of organization. There is some energy exchange between the two subsystems in the sense that the less-organized subsystem gives energy to the more-organized, and, in the process of exchange, some information in the less-organized is destroyed and some information is gained by the already more-organized. Probably it is useful from the point of view of general science (but distracting from the point of view of ecology) to remember a few such couplings: gas/Maxwell demon, electrical conductor/semiconductor, atmosphere/sea, environment/thermostat, substrate/enzyme, enzyme/RNA, cytoplasm/nucleus, mesenchym/nervous sytem, biotop/community, plants/animals, prey/predator, plankton/benthos, agrarian communities/industrial societies.

(amazing ↑ paragraph)

In all such examples, the second subsystem experiences more predictable changes through time. In so doing it stores information better and is a more efficient information channel. The first subsystem is subject to a stronger energy flow and, in fact, the second system feeds on the surplus of such energy. It is a basic property of nature, from the point of view of cybernetics, that any exchange between two systems of different information content does not result in a partition or equalizing of the information, but increases the difference. The system with more accumulated information becomes still richer from the exchange. Broadly speaking, the same principle is valid for persons and human organizations: any exchange increases to a greater extent the information of the party already better informed. Here it is pertinent to give to the concept of information the meaning of something which is arrived at by a succession of decisions and which influences the future; however, any stricter definition in terms of probabilities would be pertinent also.

The unit in such information exchanges is an event taking place between two elements *A* and *B*. Suppose element *A* has a more indeterminate position and a less predictable future, its position being associated with a more diffuse cloud of probabilities. Such an element carries and can give off more energy. Element *B* has opposite properties. The interaction event must occur closer to *B* than to *A*, and the memory of element *A* will be annihilated in the interaction. If there is an increase of information content, it will accrue to *B*. Decision-making means friction, and the bill is footed mostly by *A*. In this connection, the ideas of Landauer (1961) are very pertinent from the point of view of the ecologist.

Such relations are compounded in a hierarchical organization and are reflected at every level. Any organization can be analyzed by dissecting it into smaller and smaller blocks; the pattern of the whole organization is reflected at every division in differences of organization on either side of the boundary and in the exchange of energy at each level. Such analysis frees us from the need to define ecosystems that are more or less closed.

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DIVERSITY AND ENERGY FLOW

With reference to the whole ecosystem, a useful parameter is the amount of energy flow per unit biomass (the primary production of the system divided by the total biomass). The input energy is nearly all dissipated in respiration. It is also appropriate to speak of the entropy produced in sustaining a unit of biomass in the ecosystem; this entropy is roughly proportional to the total flow of energy. If a system has many trophic levels, the energy flow per unit biomass is lower because a fraction of the energy passes through different levels. In a system subjected to frequent changes in which a high proportion of the primary producer's substance is decomposed by bacteria (heavy users of energy with a small biomass), energy is inefficiently used and relatively more entropy per unit time and unit biomass is produced than in a more diverse and more efficient ecosystem. An equivalent argument may be applied if the ecosystem is considered as an information channel: in changing environments or in poorly organized systems, maintenance of the channel is more expensive because excess fecundity is necessary to make up for the loss of individuals. A high level of noise must be compensated for by redundancy in the message. Such a communication channel is more expensive. It is easy to understand why ecosystems with greater diversity are sustained by a lower energy flow per unit biomass. According to Ashby's law of the requisite variety in cybernetic systems, a system formed by more elements with greater diversity is less subject to fluctuations.

More convincing to the field ecologist is another argument. Imagine an ecosystem for which the opportunities to assimilate and grow are suddenly increased. Not every species responds equally to such opportunities, because the specific rates of potential increase vary among species. Moreover, species dependent on other species — for example, animals dependent on plants for food — respond after a certain time lag to the initial impetus toward the increase of biomass. Because of this fact, any sudden increment in the ratio of production to biomass is accompanied by a drop in diversity. . . . .

It should not be thought that such intellectual exercise with cybernetic models is useless, for it uncovers some unsatisfactory qualities of concepts in everyday use in ecology. Take, for instance, biomass; a good operational definition may be the amount of living mass, expressed in grams of organic carbon per square meter. But biomass is a bearer of information, and, in cybernetic models, it may be convenient roughly to equate biomass with amount of information. It is also proper in the field of cybernetics to speak of the amount of information preserved and communicated in terms of a given increase in entropy or a given consumption of energy, rather than to speak of amount of biomass. In fact, in ecosystems there are many things besides biomass which are very important in preserving information — like burrows, trails, and so on. Take, for example, the dead wood in a forest, both standing and fallen. It is no longer living matter, but it is tremendously important as a structural element. One might ask whether such wood should be included in the revised concept of 'biomass'.

MICROSCOPIC AND MACROSCOPIC ASPECTS OF THE ECOSYSTEM

Almost inadvertently we have been shifting from the consideration of elementary relations in the ecosystem, like the response of a population to an environmental change or the interaction between a predator and its prey, to elementary cybernetic feedback loops and to the multiplicity and organization of a great number of such feedback loops. Almost everyone will agree that it would be difficult, but theoretically feasible, to write down the interactions between two species, or possibly three, according to the equations suggested by Volterra and Lotka. This can be done in the ordinary differential form as in expressions (footnote), or in the more fashionable cybernetic form. But it seems a hopeless task to deal with actual systems; first because they are much too complex and second because we need to know many parameters that are unknown. Thus, we cannot use the magic formula "feed the data to a computer," the panacea of those who expect miracles from the feedback between man and machine. From the practical point of view of the average ecologist, it makes almost no sense to try to write down a system of equations similar to (footnote) for all the inhabitants of a beech forest.

It is possible, however, to approach the problem from another angle. Biology knows, or pretends to know, something about the organization of the brain; nevertheless, it still cannot afford, and is not particularly eager, to get a detailed description of the net of actual neural connections. Many general properties of the brain can be inferred from the total number of neurons, topological relations, and hierarchical patterns. The number of possible connections and functional levels, etc., can be estimated and are useful in evaluating experimental results. The same is true of ecosystems. It is possible to escape the 'microscopic' analysis of the system, the detailed knowledge of all elementary actions and reactions. A 'macroscopic' point of view is more akin to thermodynamics and cybernetics and permits manipulation of such concepts as energy flow per unit of preserved information, spectra of diversity, and so on. Volterra (1926) hinted at such possibilities. In two very stimulating papers following notions of statistical mechanics, Kerner (1957, 1959) has made considerable progress by introducing a concept of 'temperature'. This is a typical example of a macroscopic property — it is positively related to energy flow per unit biomass and inversely related to diversity.

Pond and Margalef

Besides envisaging a more extensive use of such 'macroscopic' properties or parameters in the ecology of tomorrow, I hope that the consideration of the almost unlimited divisibility of systems and of the asymmetry of the interactions between subsets may be the key to understanding the organization of ecosystems.

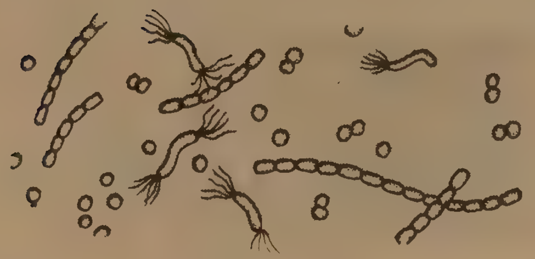
ECOLOGICAL SUCCESSION AND EXPLOITATION BY MAN

SUCCESSION

Ecosystems reflect the physical environment in which they have developed, and ecologists reflect the properties of the ecosystems in which they have grown and matured. All schools of ecology are strongly influenced by a genius loci that goes back to the local landscape. 'Desert' ecologists, working in arid countries where weather fluctuations exert a controlling influence on poorly organized communities, would hardly accept as a suitable basis for ecological theory the points of view put forward in the preceding chapter. One need only go through the books of Andrewartha and Birch (1954) and of Bodenheimer (1958) to be convinced of this. The mosaic-like vegetation of Mediterranean and Alpine countries, subjected to millenia of human interference, has assisted at the birth of the plant sociology school of Zurich-Montpellier, with Braun-Blanquet as the most representative exponent of a clear and careful bookkeeping and filing system. Scandinavia, with a poor flora, has produced ecologists who count every shoot and sprout. It is a pity that the tropical rain forest, the most complete and complex model of an ecosystem, is not a very suitable place for the breeding of ecologists. And it is only natural that the vast spaces and smooth transitions of North America and Russia have suggested a dynamic approach in ecology and the theory of climax. In such areas, the concept of succession, one of the great and fruitful ideas of classical ecology, was best formulated. An important contribution of field ecologists, it was originated by Dureau, A.P. de Candolle, Humboldt, and others a century and a half ago, and was developed primarily in America at the turn of the century by Cowles and Clements.

Succession is viewed as the occupation of an area by organisms involved in an incessant process of action and reaction which in time results in changes in both the environment and the community, both undergoing continuous reciprocal influence and adjustment. The important point is that it is an orderly and directed change. Unmistakable trends that permit prediction can be recognized, of course, only at the 'macroscopic' level.

HOME-GROWN SUCCESSION



PIONEER STAGE

FLAGELLATE STAGE

PARAMECIUM STAGE

CLIMAX COMMUNITY

How a succession of species will form a community such as might be found in ponds can be shown in a simple infusion of hay and sterile water seeded with just a few drops of pond water. Bacteria and protozoans replace each other as dominant species (above), with each species altering the food supply and paving the way for its successor's rise even as it prepares its own demise. The end stage, or climax, is a state of balance in which green algae, rotifers, crustaceans and amoebas coexist with only scattered representatives from the earlier stages.

—From Ecology: LIFE Nature Library, 1963

In ecology, succession occupies a place similar to that of evolution in general biology. The parallel extends as well to some conceptual difficulties. Everyone seems to agree that evolution is 'progressive'. But definitions of progress are often imprecise or contradictory. The comparison of a series of species that probably represent links of a phylogenetic chain do not always allow one to abstract trends of general applicability. Some paleontologists, aware of obvious directions in evolution, have preferred to gloss over the problem by inventing names like 'orthogenesis'. In doing this, they behave like some ecologists, among whom the belief was, and is still widespread that a good way to conceal ignorance is to invent some beautiful name with a Greek sound. In general, ecologists agree that succession follows a direction, but opinions differ when a working definition, or even some criteria or common characters of the usual trend, are to be formulated in a concrete way.

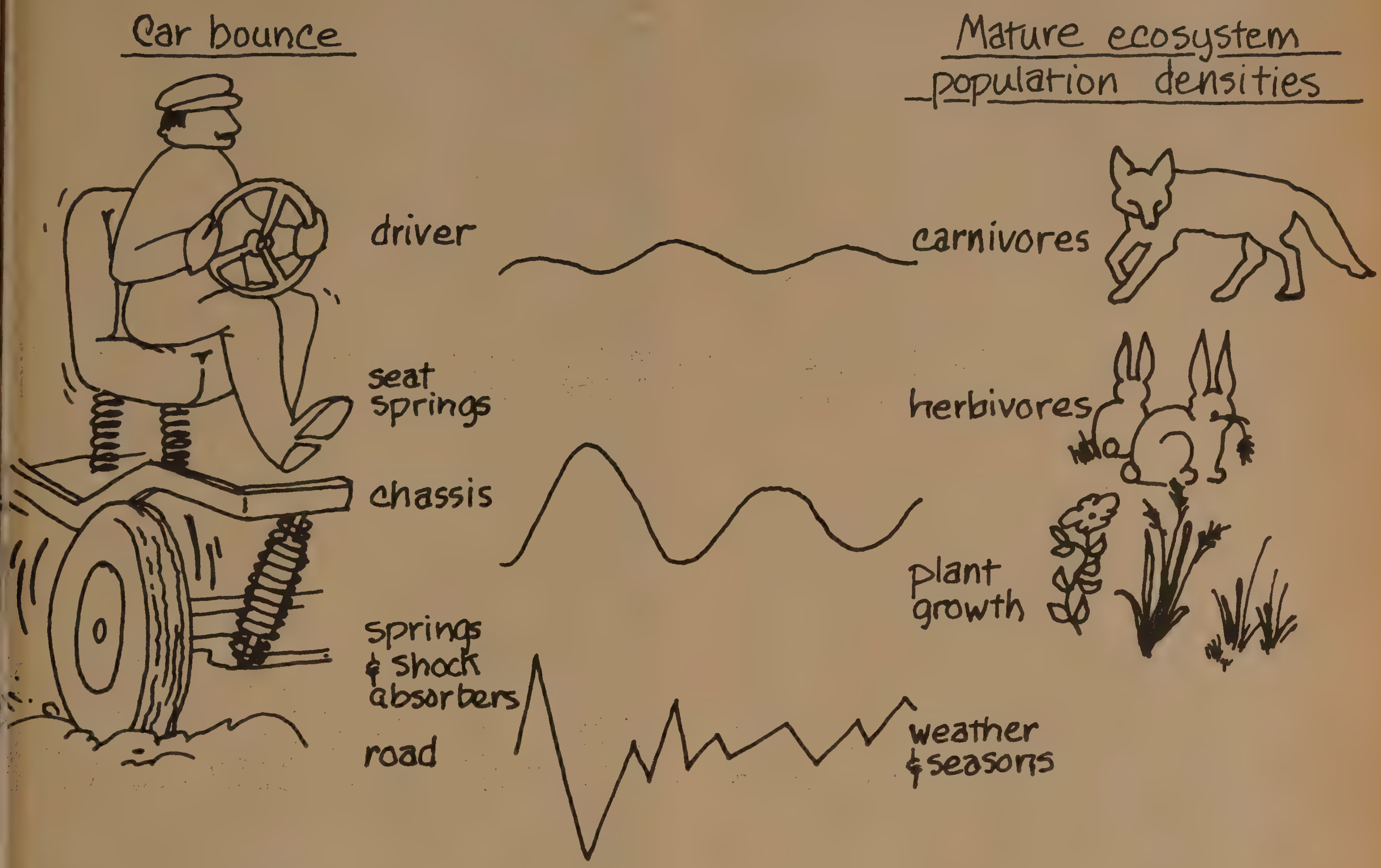
There exists an important body of data and speculation about succession. The raw data consist either of actually observed successions, including the description of different stages through time, or, more frequently, of an ideal reconstruction based on ecosystems observed in different places at the same time. These 'snapshots' are serialized to produce what is supposed to represent a natural succession. The student of evolution who postulates certain relations of descent among certain species that he knows only on the basis of fossil material is subject to the same sort of criticism as the ecologist who draws an ideal schema of the time succession linking a number of communities that he has observed in different places at one time. In both cases, the proposed orderings are not based on observed sequences, but on abstract criteria that define what should be the expected changes during evolution or during succession. A number of working principles are used to classify and serialize the stages of hypothetical successions. They are not always explicit.

Prominent among the criteria used are the following: during succession there is a trend toward increase in biomass, stratification, complexity, and diversity. Sometimes, too, a maximization of the total production is assumed. Another frequently used criterion is increased stability, that is, a reduced frequency of fluctuation and a major independence from environmental change. In many instances, succession is linked to geographical patterns, and then the importance of local climates for the different stages becomes evident: some climates cause a total arrest of succession such that the community is held in certain stage; under less restrictive conditions, progress may simply be slowed, and the development of the ecosystem itself may help to alter the climate and introduce future development of successional stages.

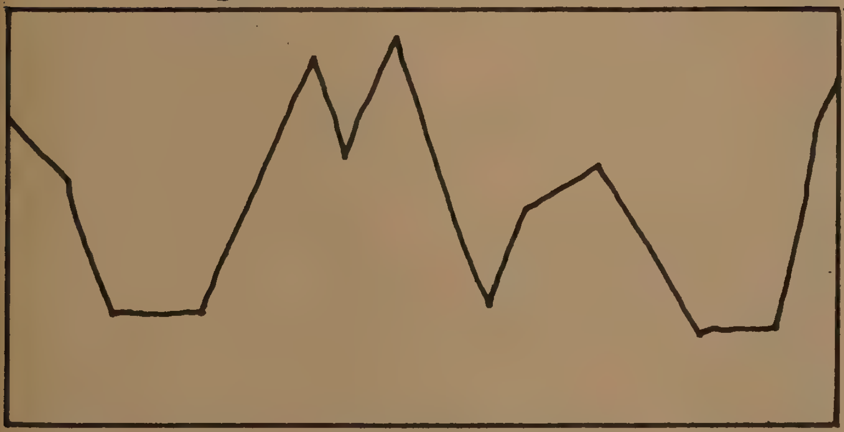
A NEW LOOK AT SUCCESSION

I have sketched a more or less classical introduction to the problem of succession. Now, if we look at succession from the point of view set down in the preceding chapter, it appears to be a process of self-organization occurring in every cybernetic system with the properties of an ecosystem. A self-organizing system can pass through different states; any change that leads to a state more resistant to further alteration is immediately assimilated. It is probably justified to say that any system formed by reproducing and interacting organisms must go on to develop a kind of assemblage in which the production of entropy per unit of preserved and transmitted information is at a minimum. The structures that endure through time are those most able to influence

FLUCTUATIONS

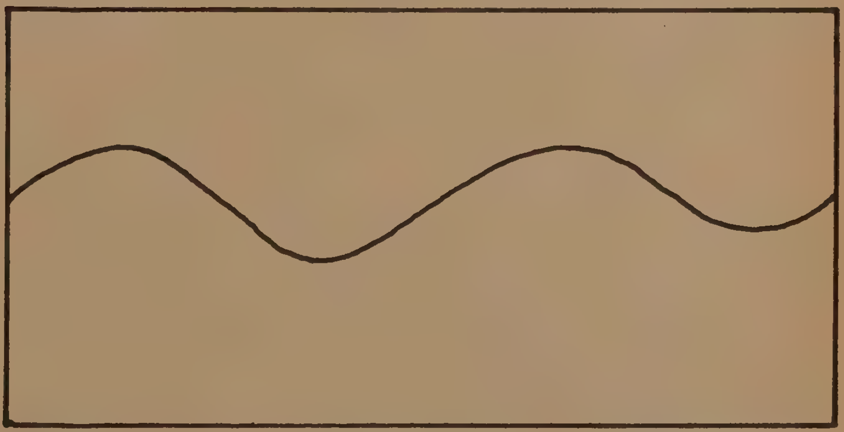


Young ecosystems



Frequency and amplitude not predictable

Mature ecosystems



More regular fluctuations. Frequency and amplitude predictable.
More information = more predictability = more stability = less perception of new information.

Diagrams conceived by Peter Warshall and drawn by Carol Kramer.

the future with the least expense of energy. The process of succession is equivalent to a process of accumulating information. The initial, poorly organized, stages receive the full impact of the environment and any changes in it. Individuals of different species are selectively destroyed. The process of acquiring information must be fed by a surplus production of new organisms. Relative energy flow is high and represents the cost of accumulating information. In time the acquired information is expressed in a new organization of the ecosystem. This organization takes into account the predictable changes in the environment, and even controls the environment, so that in the future much smaller changes in the community are necessary to keep it in stable occupation of its area. More information is being transmitted through time, and the environment, as a source of new information, is less important than at the beginning of the process. One can say that the ecosystem has 'learned' the changes in the environment, so that before change takes place, the ecosystem is prepared for it, as it happens with yearly rhythms. Thus, the impact of the change, and the new information introduced, are much less.

It is a general property of many systems that acquired information is subsequently used to close the door to a further inflow of information. In general, the development of a personality involves the use of information to make oneself impermeable to new sources of information; this is, of course, regrettable, especially in the scientific personality. Everyone knows how difficult it often is to make new ideas acceptable to a hard-boiled scientist; only youth is plainly receptive to the many suggestions that come from the outside world. Patten (1961), in a very creative paper, calls our attention to the pertinency of a von Neumann's game, in which one of the two players seeks to gain information from the other to use in blocking his gain of information from the other. Patten adds that the solution of such paradoxes is a fundamental problem of regulation. Translated to the field of ecology, the paradox means that the community seeks to gain and does gain information from the environment, only to use such accumulated information to block any further assimilation of information. This process is succession.

A theory of succession based on such considerations should pass the test of being explanatory and predictive. But prediction has to be limited to the 'macroscopic' level. Prediction in detail is impossible. An ecosystem is a historical construction, so complex that any actual state has a negligible a priori probability. The same is true of evolutionary theory: some general trends can be assessed and future developments can even be predicted, but no one expects a prediction extending to the minor details of structure and function.

CHANGES OCCURRING DURING SUCCESSION

It is difficult to summarize all the available information on succession. I have done this for some marine communities (Margalef 1962*b*), and many textbooks on ecology offer valuable chapters on plant succession. Some common trends can be abstracted from the data. Of course, such trends refer exclusively to the characters or properties that have been called 'macroscopic'.

Biomass increases during succession as, almost always, does primary production; however, the ratio of primary production to total biomass drops. Diversity very often increases. Sometimes diversity increases to a certain value and then decreases again toward the final stage of succession. But such situations can probably be better described in terms of diversity spectra. A spectrum with a plateau is replaced by a steep spectrum. Kershaw (1963), Pielou (1966), and other workers have dealt with such problems. According to Pielou, during succession species diversity decreases and pattern diversity increases; that is, diversity and organization shift to higher levels. We might compare a well-developed and mature ecosystem to a picture by an old master — the pattern of a developing system would be rather like some form of op art. (Incidentally, diversity and information theory are highly useful in the analysis of artistic creations.)

During succession there is an increase in the proportion of inert or even dead matter with a low respiratory rate, such as wood, shells, and so on. The proportion of structures like burrows, paths, and territory markers, which may be considered as stores of information, also increases. Fluctuations are damped and rhythms change from reactions directly induced by external agents to indirect responses to stimuli associated with ecologically significant factors; the ultimate trend is to endogenous rhythms.

The increase in diversity is related to a multiplication of ecological niches, a process that goes with longer food chains and much more strict specialization. Judging from data on the feeding efficiency of animals, it seems that animals at the top of long food chains and animals of more specialized habit show a higher efficiency. This results in a major, overall gain in efficiency in the advanced stages of succession.

In later stages of succession, a relative constancy of numbers is achieved, and populations are not forced to reconstruct themselves rapidly after drastic and extensive destruction. The natural trend is toward a reduction in the number of offspring produced and better protection for the young. Means of dispersal are also different. Pioneer species are more adjusted to indiscriminate dispersal. In initial plant communities in the succession, a major proportion of the diaspores are carried away by wind, but in later stages plants with seeds dispersed by animals are more numerous. In fact, such plants are geared to animals belonging to the same ecosystem, so that the whole ecosystem develops an organized dispersal. Only in the initial stages of ecosystems is there an important and fluctuating store of precious nutrients in the environment. In the more advanced stages organisms exert more vigorous control, and the major proportion of biogenetic elements are stored or retained by the living organisms.

Ecosystems are composed of replicable prefabricated pieces — individuals of different species. The supply of species is limited; thus, succession cannot go on forever. Succession is an asymptotic process. Only evolution in the framework of the ecosystem can improve things a bit and allow further progress.

THE FINAL STAGES OF SUCCESSION

In ecology it is customary to speak of the climax, with reference to the final stage of a succession, when the ecosystem is in equilibrium with the existing supply of species and the properties of the local environment. The concept of climax has led to controversy over how far changes themselves are to be included in the characterization of environment. This problem is more acute in cases in which populations and ecosystems are processes rather than 'stable' organizations, as in running water. Many ecologists, myself included, are disinclined to speak of climax at all in reference to plankton in rivers. The problem is not serious if we are prepared to drop completely the world 'climax' and speak instead of less and more mature ecosystems. We are then free to define the conditions of maximum maturity to which someone else might affix the label 'climax'.

Succession is not necessarily a continuous process. In the coastal and shallow waters of tropical seas, extensive meadows of sea grasses (*Thalassia* and others) cover large areas. An ecosystem of different structure, the mangrove, then develops on the edge of the water, encroaching on the submerged community of sea grasses. This substitution is another step in ecological succession, but it is linked with the use of a substantially different source of carbon dioxide. In the first stage the carbon dioxide is dissolved in the water in the form of dissociated carbonic acid, but it is in gaseous form in the subsequent stage. Such important and somewhat discontinuous steps in succession have been called 'relays' (Dansereau 1954), a concept that may be of utility.

In terms of the expressions (footnote) of the preceding chapter, succession is the result of an indefinite iterative process with a stationary end state to which the variables tend. A set of conditions controls a set of rates of change of the same conditions, and the whole system is directed toward an asymptotic steady state. This could properly be called a climax. But unpredictable fluctuations — unpredictable for the organization of the ecosystem at the moment of their onset — can change the values of environmental factors (E), or the numbers of individuals of some species (N_i), altering the smooth running of the model. The process of self-organization stops when fluctuations are unpredictable or insurmountable. In an arctic environment, the hard conditions of life that exist during part of the year limit the accretion of organization. The amount of organization that can be transmitted to the next vegetative period is rather small. This is characteristic of the tundra. Farther south, in the belt of deciduous forests, development of vegetation can achieve a more complex structure that includes trees, but there must still be a period of dormancy and numerous forms of life are excluded. Only farther south, in a part of the tropics, is the environment stable enough to allow succession to go indefinitely and to achieve ecosystems of a very high level of organization. Some authors, like Connell and Orias (1964), do not agree that the tropics are closer to equilibrium and that the temperate zones are in a successional state of development; their opinion is probably related to their special interpretation of the concept of climax.

Today the most mature systems on earth are found in regions of high temperature: the coral reef in the sea and the tropical rain forest on land. Nevertheless, the point is that stability is a more important factor than temperature, as can be observed by studying the actual distribution of coral reefs. In addition, very mature systems do exist in rather cold environments, provided that periodic frost does not destroy organisms. The deep sea communities, with high diversity (Hessler and Sanders 1966), have all the properties of very mature ecosystems: a low metabolism, limited production of offspring associated with advanced care of the brood, and so on. The communities of organisms living in caves are also very mature. Of course, both ecosystems are dependent for their energy on others in illuminated places, but such dependence is not material to the consideration of those properties that testify to a long process of succession (and evolution).

It is fascinating to contemplate the possibilities inherent in stable environments existing in rather cold temperatures. Perhaps such a situation was achieved in some early period of the history of our planet; perhaps exobiology will some day afford appropriate examples. In a system at high temperature, a higher amount of entropy is produced in the exchange of a fixed amount of energy. In consequence, a system at high temperature cannot go as far (cannot reach

"During succession there is an increase in the proportion of inert or even dead matter with a low respiratory rate, such as wood, shells, and so on."

A marine snail shell, a Radiolaria skeleton, and star corals – from Ernst Haeckel, **Art Forms in Nature,** *1904, 1974, Dover Publications.*

the same degree of maturity) as an equivalent system at a lower temperature. Anything that accelerates change and energy flow in an ecosystem causes a reduction in potential maturity. Nevertheless, it happens that at the present time the most stable environments are found in the tropics.

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EXPLOITATION

One important contribution of the study of plankton to general ecological theory arises from one of the most essential properties of pelagic ecosystems, their subjection to steady exploitation. The plankton in superficial water is an expanding community; a fraction of planktonic organisms is continually settling down. This continuous leakage of a part of the biomass requires a higher rate of primary production per unit of remaining biomass, and selection pressure favors a few species with a high rate of potential increase, so that diversity is rather low . . . Plankton in surface water, like plankton in running water, is in a state of low maturity; for this reason, I am reluctant to speak of climax in reference to such systems.

Plankton in surface water is exploited by communities in deeper water (the benthose), and populations in the upper reaches of a river are exploited by populations downstream. Now we are able to link the concept of maturity with the concept of exploitation. A more mature system always exploits a less mature system, and the notion of exchange across a given boundary may be helpful in assigning the adjoining systems to their proper places in an ideal succession. The problem can be put into an appropriate perspective by the following reasoning. Suppose we have two adjacent systems of different degrees of maturity. If succession proceeds, any line marking a particular value of the 'macroscopic' characters used as indicators of maturity (diversity, ratio of primary production to biomass) should move toward the system that was and is of lower maturity, since the maturity of the whole complex of subsystems is increasing. But if there is a strong exploitation of the less mature subsystem by the more mature one, the line may not necessarily move. This is because the excess production, which the less mature ecosystem could use to increase its own maturity, is being transmitted to the other subsystem. Thus, the less mature subsystem is kept in a steady state of low maturity by the exploitation to which it is subjected. In nature things are probably not so clear-cut; there is always some exploitation going on, but part of the surplus is used in increasing local maturity.

In future development of a quantitative treatment of this problem, we must try to unite both autonomous (passive) movement of organisms and active exploitation on the part of the other subsystem in any formula expressing exchange across a boundary. Moreover, we must include exchanges of nutrients and organic matter outside the bodies of living organisms.

Successions are stopped by fluctuations in the environment, which may be equated to exploitation. After all, a frost that destroys living tissues, or natural catastrophes that do away with a high fraction of the population, really represent exploitation. Exploitation has a rejuvenating effect on exploited ecosystems. It is sufficient to add a protozoon to a senescent culture of algae to observe a rejuvenation in the plant population, with a higher energy flow per unit biomass and a more juvenile composition of plant pigments. In a way, the addition of a new trophic level to a system means a certain amount of rejuvenation of other trophic levels, increasing turnover.

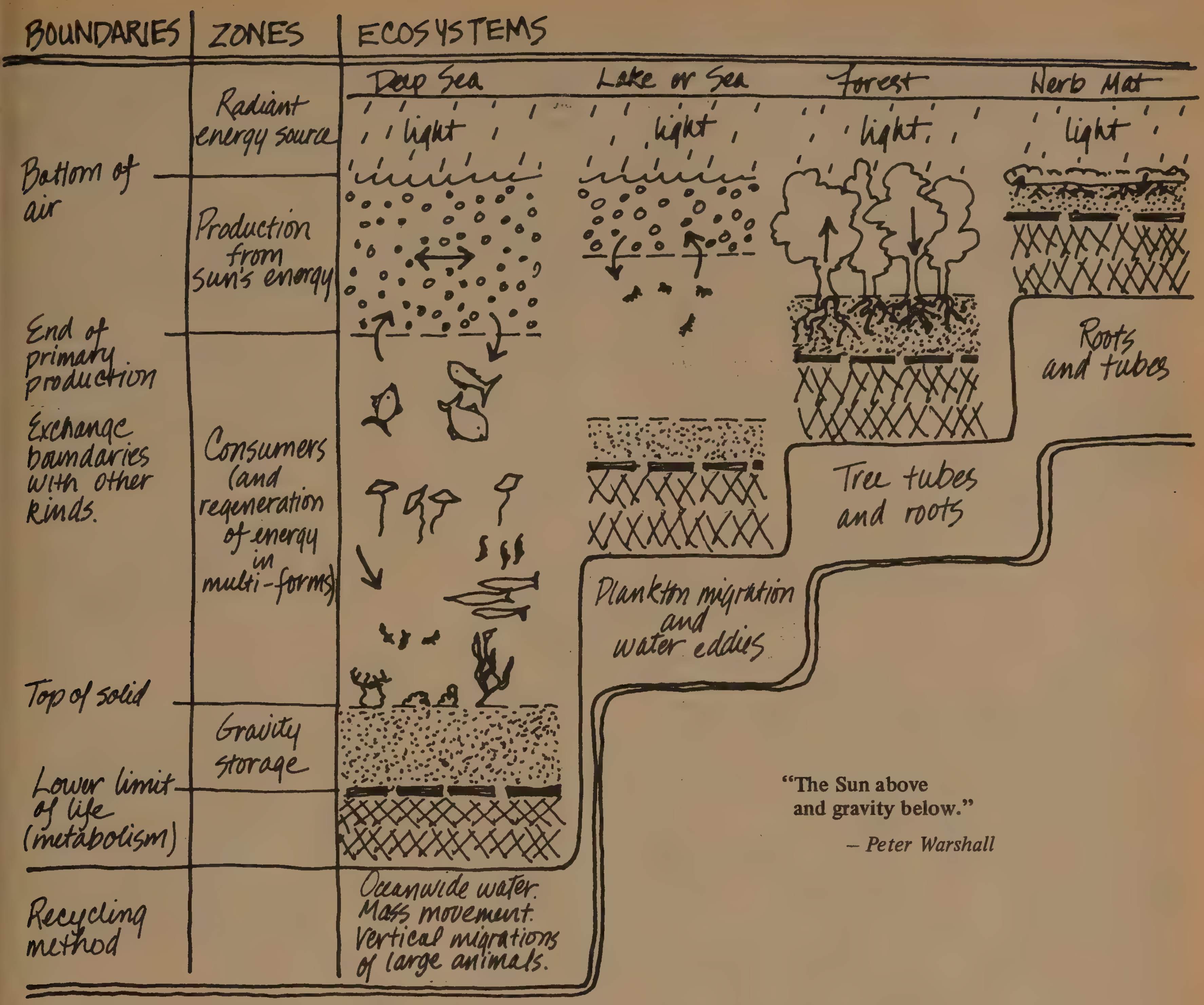
Plankton is the ecosystem in which the tenuous equilibrium between succession and exploitation can be best observed. Changes in the turbulence and stratification of water masses switch the process one or the other way. In turbulent water there is a large loss of plant cells, and the system is juvenile. If water stratifies, succession proceeds immediately but slowly, because there is always some degree of exploitation. Only in stratified water masses are relatively mature plankton systems found.

BOUNDARIES

Descriptive ecology uses maps with patches of color intended to represent different kinds of communities or ecosystems. Ecology is, or at least has been, very prone to formalism, and a word, 'ecotone', was introduced by Clements to designate the ambiguous boundary between patches. Happily enough, in the etymology of the word there is a reference to tension — a suggestion of something dynamic that can give life to the patches of a map. Indeed, such boundaries must be considered places of tension where two organizations meet and exchange their respective components, or as places where stresses of a genetic character, important in evolution, are at work. In practice, however, ecotones often disappear when we look for them. Descriptive ecologists often base descriptions of communities on typical spots observed in the field, tracing in the boundaries as homework. In fact, we do not really need marked frontiers. It is enough to observe that the composition of an ecosystem is different in two spots to assume that some change must occur between them — perhaps gradually, perhaps more steeply.

Not all boundaries are the same. Some may be drawn between patches of different specific composition but of equal maturity. The most important are those separating subsystems of different maturity, like the ones delimiting concentric belts of vegetation around a senescent lake or those running parallel between a sand dune and the forested land behind it. Although we were disposed to save it, the expression 'ecotone' is denied to us in this case by Shelford, who expressly declares in his **The Ecology of North America** (1963) that he will not use or apply the term 'ecotone' to the boundaries between communities that represent different stages of a succession or serial transitional communities. Sometimes ecotones that are very clear, like those along shorelines, separate ecosystems that are different in many respects, including degree of maturity. Here it is pertinent to remember that if two ecosystems in contact are of very different composition, transfer across the ecotone is in the form of detritus. This is how exchange is established between marine and terrestrial ecosystems along a shore or between marsh vegetation and the aquatic organisms living in estuaries.

In a preceding section, the relative importance of exchange in relation to the mobility of ideal or visible boundaries has been discussed. Now some attention should be given to the detailed outline of the boundary. According to van Leeuwen (1965), more undulating boundaries are found in more mature systems and less complicated frontiers in the less mature. But what happens if a more mature system faces a less mature one? The forces at work on the outline of the boundary should depend on general properties of the respective systems: higher mobility, especially random or diffusion mobility associated with a more rapid turnover in the less mature subsystem; more rigidity or determinism in position and organization in the more mature. Probably some concept analogous to surface tension could be developed and applied to the characterization of ecosystems. I suggest that such analogs of surface tension would decrease during succession. It seems that it is advantageous for the more mature and exploiting system to develop sinuosities and stretch the length of the boundary to the maximum. Just as intestinal villi absorb the contents of the intestine, some benthic populations develop digitations that make the exploitation of suspended systems easy. In the opposite case, in less mature communities the trend must be to reduce to the


BOUNDARIES
ZONES
ECOSYSTEMS
Deep Sea
Lake or Sea
Forest
Herb Mat
light
light
light
light
Radiant energy source
Bottom of air
Production from sun's energy
End of primary production
Exchange boundaries with other kinds.
Consumers (and regeneration of energy in multi-forms)
Top of solid
Gravity storage
Lower limit of life (metabolism)
Recycling method
Oceanwide water. Mass movement. Vertical migrations of large animals.
Plankton migration and water eddies
Tree tubes and roots
Roots and tubes

"The Sun above and gravity below."

– Peter Warshall

Diagram derived from Odum, **Environment, Power and Society,** *by Peter Warshall and Carol Kramer.*

minimum the extension of the boundaries that are potential sites of exploitation. These conclusions were suggested by consideration of a pattern of distribution observed again and again in planktonic ecosystems. If there are patches of different maturity, they are not disposed in a mosaic but rather follow a honeycomb pattern, with precisely discontinuous areas of lower diversity enclosed in a honeycomb of higher diversity. I have wondered about the forces in action in this case when flying over an expanse of clouds, where similar patterns can be observed. Systems of circulating cells, with convergences and divergences, may appear through action of wind, and even, on a very small scale, by the activity of organisms themselves (Platt 1961, Crisp 1962). In such a case there is a tendency to form a honeycomb pattern, and the dispersed phase with expanding populations is represented by the divergences.

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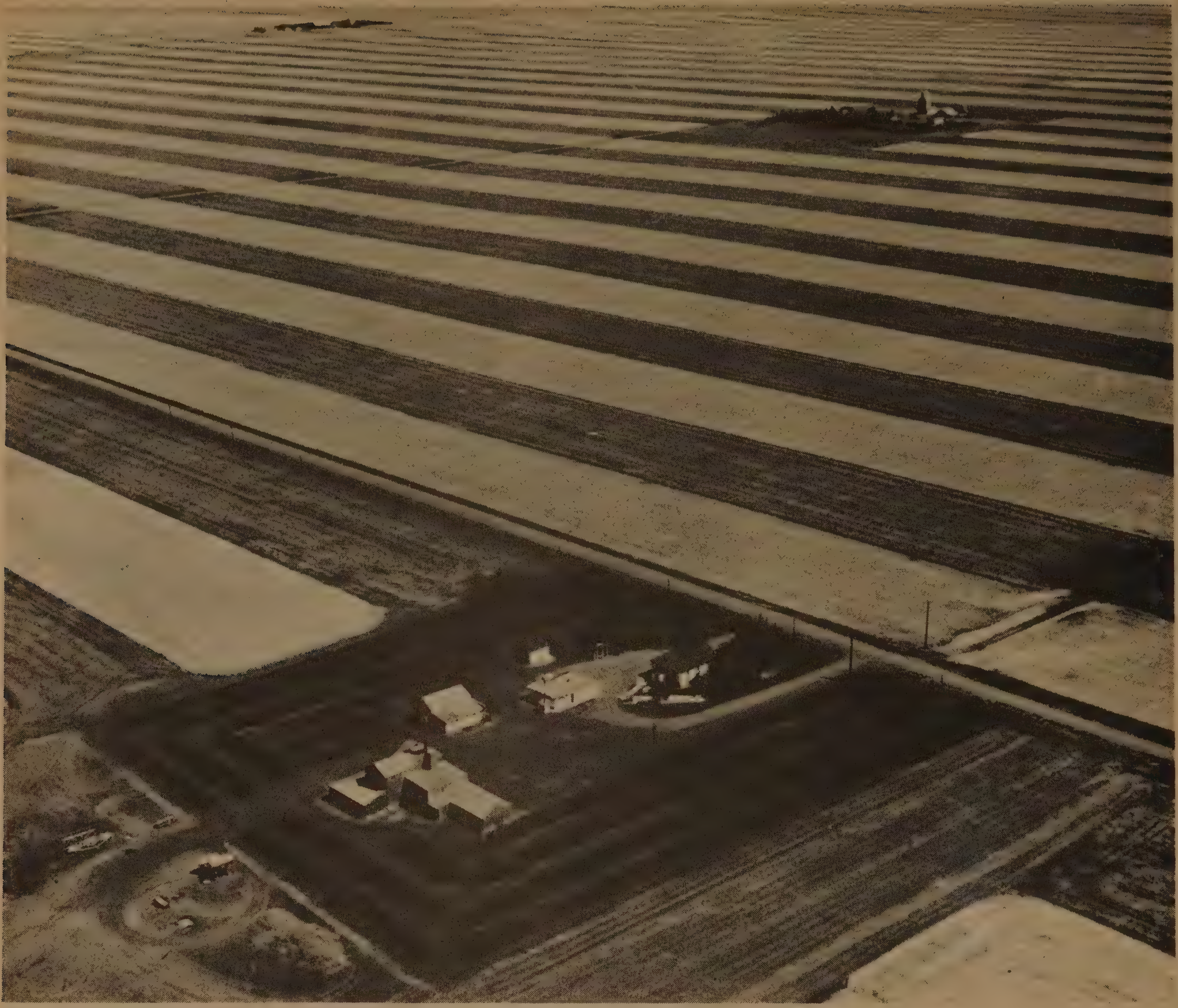
APPLIED ECOLOGY

In some fields of natural science, the pure scientist sometimes looks disdainfully at human artifacts or at the products of cooperation between man and nature. Asking a serious botanist the name of a flower can elicit the scornful answer, "this is only one of those wretched garden plants!" They are simply not interested. The ecologist cannot adopt such an attitude, but this is not to be construed as a special open-mindedness toward practical problems. Ecologists, like other scientists, are mainly motivated outside the practical sphere. But ecologists must be interested in practical problems for truly scientific reasons.

It is rather difficult to understand the workings of a very complex system like an ecosystem through a detailed input-output analysis; a good study procedure is to subject the whole system to more or less important changes of a very gross nature, to see if and how the general behavior is changed. In other words, the black box of the system has to be shaken. Such a study would be extremely expensive for the ecologist to carry out in natural systems, but he can profit from the drastic changes that man is inflicting every day on all sorts of ecosystems around the world, try to understand their reactions, and use such valuable information for the construction of ecological theory. Besides, as a justification to agencies sponsoring research, ecologists can claim, mostly legitimately, that their findings are invaluable for practical questions of exploitation and conservation.

HUMAN EXPLOITATION

The most direct action of man on nature is exploitation. Man can be considered as a subsystem coextensive with the exploited system. Exploitation reduces maturity or puts a brake



Montana farmland

on succession. In the exploited system diversity drops and the ratio of primary production to biomass increases. Take, for instance, agriculture. Exploitation of crops means a simplification of the ecosystem in comparison to preagricultural stages. The exploited ecosystem is composed of a lower number of species and also a lower number of biological types (grasses, forbs, trees, etc.). The structure of soil is simplified and the diversity of populations of soil microorganisms and animals decreases. The importance of the cycle of nutrients outside the bodies of organisms is amplified. Yearly rhythms become more stressed, not only for the cultivated species but also for species associated with culture as weeds or pests. The latter are biologically more similar to cultivated species than to species in natural ecosystems. They increase rapidly in numbers, disperse easily, and their populations are subjected to strong fluctuations and can be reconstructed after heavy losses. Outbreaks are characteristic of systems with low species diversity (Pimental 1961). If exploitation and culture are discontinued, succession starts the reconstruction of more mature ecosystems.

The basic consequences of exploitation and culture can be duplicated nicely in experiments with aquatic systems, most appropriately in introductory ecology courses. Two aquaria, freshwater and marine respectively, are installed and inoculated with material of different origin. After a few weeks or months a relatively well-balanced community is found in them. Species composition, diversity, plant pigments, primary production, and total biomass are recorded. Both aquaria are then subjected to the analog of plowing a field and fertilizing it. Small and equal amounts of a solution of nutrients are poured into the aquaria, and their contents vigorously stirred. The whole set of analyses is repeated the next day. A few species will increase rapidly, diversity will go down, chlorophyll-a will be synthesized at a higher speed than other pigments, and the ratio of primary production to biomass will increase dramatically. These results are a good analogy of what happens in a field subject to culture. It is a good point to make students notice by themselves that the changes are the same in both aquaria, although they have no species in common. This leads to useful discussion of 'microscopic' versus 'macroscopic' parameters in ecology. In agriculture too there are microscopic aspects, such as those emerging from the study of the effects of thermal and rain cycle on plant development, the use of fertilizers, and so on. But the purpose of the experiment is to emphasize macroscopic parameters as well as to demonstrate their importance to practical and applied questions.

Human exploitation in a sustained form is possible only if carried on in an ecosystem of low maturity, with a relatively simple structure and a high ratio of primary production to total biomass. Productivity, or primary production per unit biomass, is maximum with almost no biomass, and decreases

New York City

“Pumping more energy in and out of a system simplifies it.”

steadily up to the maximum biomass. Maximum total yield is possible at some point in between, where productivity multiplied by biomass is maximized. Ecosystems subjected to natural fluctuations can resist human exploitation without collapsing and without much change. The taiga is much more exploitable than tropical forest, and populations of clupeoids (sardine, herring) are much more exploitable than populations of fishes of the coral reefs.

When subjected to exploitation, systems of higher maturity regress and acquire properties similar to those of some preceding stage. Intentional or unintentional exploitation of forests leads to a simplification of the canopy composition and a relative increase in the participation of the fastest-growing species. In general, exploitation of mature terrestrial ecosystems leads to an open vegetation, similar to that of steppes and grasslands, which is subjected to periodic fires, heavy grazing, or other natural agents of exploitation. Man has substituted himself for fire and large grazers, so human evolution and acculturation have been favored in this sort of environment. Above all, temperate climates with ecosystems of rather low maturity have proved especially able to sustain exploitation. Moreover, a large store of wood and cellulose awaited man because it had been poorly exploited by animals. Without doubt, general ecology has something to say concerning the evolution of humanity.

CONSERVATION

A strong exploitation of very mature ecosystems, like tropical forests or coral reefs, may produce a total collapse of a rich organization. In such stable biotopes, nature is not prepared for a step backward. Man has to be very careful in dealing with systems of high maturity.

The interference of man goes farther than simple exploitation. Even if man introduces into natural ecosystems nutrients or a potential source of energy in the form of organic compounds, the effects are similar to those of exploitation. There is an acceleration of energy flow and a simplification of structure, with destruction of many homeostatic mechanisms.

Eutrophication of lakes is a good example. Radioactivity destroys structure but does not greatly affect energy flow; the ratio of primary production to biomass is increased and the system becomes less mature (Platt 1965) as was predicted (Margalef 1963*b*).

The species that suffer most from human interference are those endowed with a low rate of multiplication and linked by multiple, if sometimes tenuous, bonds to other elements of the ecosystem. Such species often provide interesting examples of mimicry and other elaborate defenses and impress conservationists by their ‘exotic’ appearance. The use of pesticides, mitotic poisons, and radioactivity affects such species first, before species competing more directly with man in the use of primary production.

Any human intervention in nature, even presupposing good intentions, can rarely be reconciled with the idea of strict conservation. True, homeostasis in natural systems is always active, and although man tries again and again, he rarely produces truly catastrophic changes in the biosphere. But this is a credit to the efficient organization of ecosystems and not to the wisdom of man. Genuine conservation forbids any interference.

Any project of limited conservation must state an end; sometimes it is simply not to push exploitation farther than a point of adequate yield. In other cases the preservation of the structure of the exploited system above a definite level can be added as a condition. In any case, the study of macroscopic properties of systems, and perhaps just of the spectra of diversity or the quality of pigments, will provide useful criteria for controlling and judging exploitation and the results of conservation measures.

It is impossible in these times to develop a ‘natural’ ecology, one that ignores the impact of man. Ecology should inspire a wiser management of nature: the feedback should work. Few natural populations have been sampled so extensively as those of commercial fishes, yet some criteria used in fisheries management belong to old ecology. The ecosystem is analogized to a machine — this is the input, that the output. But a new and important notion is that the working of the machine is related to the energy passing through it. Pumping more energy in and out of a system simplifies it; it becomes different and works differently.

Straightforward exploitation of ecosystems has assisted in the selection of their components for productivity. Man has further developed adequate organisms to exploit grass communities and to serve as a link in the food chain ending with man. Efficiency can undoubtedly be increased but proposals like the one to use indigenous phytophagous animals for the exploitation of African ecosystems have probably been motivated by the desire to preserve certain species while appearing to be generous to native human populations. Such proposals merit close attention, although in my opinion they are consistent neither with good exploitation nor with conservation.

[more →]

To sum up, exploitation as opposed to conservation is a great dilemma, and there is probably no solution that could satisfy the aims of both. Ecology can devise most efficient means of exploitation, but conservation requires non-interference with nature, even refraining from "protecting" her. Probably the best solution would be a balanced mosaic, or rather a honeycomb, of exploited and protected areas. Conservation is also important from the practical point of view: lost genotypes are irretrievable treasures, and natural ecosystems are necessary as references in the study of exploited ecosystems. Moreover, mature ecosystems are factors of stability. The International Biological Programme has at least been useful in pointing out that the conservation of nature has utilitarian aspects and that there may be a stronger motivation for promoting it than the usual esthetic and sentimental reasons.

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EVOLUTION IN THE FRAME OF ECOSYSTEM ORGANIZATION

SUCCESSION AND EVOLUTION

The subject would be best described by the title, but only the title, of a delicious book by G. E. Hutchinson, **The Ecological Theatre and the Evolutionary Play.** I presented the basic points of view sustained here in a short communication to the Fifteenth International Congress of Zoology, held in London in 1958 (Margalef 1959). This paper passed unnoticed, so it is not superfluous to present the same argument again, including some further development.

Books on ecology sometimes include a chapter on ecology and evolution which deals principally with isolating mechanisms, the action of environmental factors on the frequency of mutations, genetics of populations, and some comments on the wonderful adaptations revealed by the field of ecology. Here I want to adopt a different point of view and a different reasoning, perhaps with certain similarities to the paleontologist's way of thinking. In both areas, that is, in paleontology and ecology, the picture is sketchy and oversimplified and there may be actual danger of being led to make sweeping, though incorrect, generalizations. Many of the supposed mechanisms and pathways of evolution must be considered as tentative, for geneticists have neither confirmed nor dismissed them.

Natural selection is not as wasteful as it is assumed to be in popular books because it uses energy that would be lost anyway in keeping an ecosystem running. The energy gates at the places where species interact — or where they interact with environment — are the organs by which selection is achieved and evolution occurs, the rate of evolution depending on the efficiency of the gate. Succession in any self-organizing system involves the substitution of some piece of the system by some other piece that allows the preservation of the same amount of information at a lower cost, or the preservation of more information for the same cost. In this context, information is anything that can influence and shape the future, and the cost is represented by the energy used, which amounts, practically, to the energy entering the ecosystem as primary production.

Evolution cannot be understood except in the frame of ecosystems. By the natural process of succession, which is inherent in every ecosystem, the evolution of species is pushed — or sucked — in the direction taken by succession, in what has been called increasing maturity. The implication is that in general the process of evolution should conform to the same trend manifest in succession. Succession is in progress everywhere and evolution follows, encased in succession's frame. As a consequence, we expect to find a parallel trend in several phylogenetic lines which can also be recognized as a trend realized in succession. For instance, a decrease in the ratio of production to biomass and an increase of the efficiency and specialization should be common trends in phylogenetic lines. Such iterative paths in evolution have given rise to words and so-called theories like orthogenesis, a non-explanatory term meaning only 'regularity in direction'. Orthogenesis results from the combination of what is possible in the already acquired organization of the genetic line with what is required by an ecological theater that is always shifting in the same direction.

Actually things can never be so simple. Evolution cannot be wholly encompassed in the slow pace of succession. Without doubt, many lineages have passed along their phylogenetic history from one type of ecosystem to another. Other modes of evolution may represent passage from one trophic level to another, as probably has happened more than once in the evolution of pelagic crustaceans. This may be a rather discontinuous process. Nevertheless, I think that what is more important, and what has not been sufficiently stressed, is that the elementary steps of evolutionary change are always constrained by the organization of the ecosystem, always caught in a similar process of self-organization. Perhaps some exceptions exist. In an ecosystem where trophic layers are being added, the lower trophic levels are rejuvenated, kept by exploitation in a condition of low maturity, and species in those lower levels are not subject to the usual momentum of succession. They may become stagnant. Perhaps this is the reason why so many primitive types (silicoflagellates, radiolarians, etc.) are still found in the plankton relatively unchanged, or as zooxanthellae enslaved by animals.

There is another facet to the subject of prospective evolution. New empty spaces are continually produced — places where the ecosystems are altered or destroyed — where succession starts anew. The mosaic of the biosphere shows all possible states of succession. Evolution going in the other direction, producing opportunistic or pioneer species in ecosystems of low maturity, is less documented, probably because it is more rapid and its results are more difficult to understand. Tempo and mode in evolution appear linked to basic properties of ecosystems, in a most fundamental feedback circuit. The properties of an ecosystem depend on the organisms of which it is formed, but the evolution of such organisms is under the control of a process of self-organization operating in the whole ecosystem.

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In very mature ecosystems, a multiplicity of links and a general slowing down of dynamics result in less brutal and more subtle competition. The success of species is linked to multiple and delicate relations. Species adjusted to a way of life that depends on the persistence of the whole ecosystem may evolve to practice some sort of ecological altruism (for example, trees giving bread and board to insects, in the form of galls). Such characters could be considered useless and even detrimental if the species are considered separately. The apparent paradox of species with a lower rate of increase outcompeting species with a higher potential rate of increase is central to the problem of evolution of competition.

CHARACTERISTICS OF SPECIES ADAPTED TO DIFFERENT STAGES OF SUCCESSION

Summarizing what has been said, the comparative study of different stages of succession may uncover many mechanisms that explain why they are the source of species with peculiar evolutionary characteristics. The extreme types can be characterized as follows:

Initial stages

These are characterized by species of short life-span which leave numerous descendents and have long-range ways of dispersal. These species are capable of developing adaptive cyclomorphosis and local adaptive modifications and maintaining a certain genetic unity. They are euryoecic, adapted to changing conditions in time and space (Levins 1962-63). They compete for dominance; they are also capable of rapid evolution. The most important criterion, opportunity, encourages a dynamic type of selection (cladogenesis, aromorphosis). The multiplicity of names such species have received — fugitive, pioneer, opportunistic, prodigal, apocratic, or kinetophilous (Erdman 1963) — testifies that their nature has been recognized and that they have awakened interest.

Mature stages

These contain species with a longer life-span which are isolated in small breeding communities, produce a small number of descendants, and have poor possibilities for dispersal outside the immediate neighborhood. Biochemically and behaviorally they are very well integrated into the system; their characteristics include a territorial instinct and a need of active substances (e.g., vitamins) produced by other organisms. Canalized development and strong stability, both morphologic and genetic (ready elimination of 'creative' variants), are also characteristic of these species. Competition may shift to the level of the genus. Efficiency, the key criterion, leads to a stabilizing type of selection (anagenesis, telomorphosis, orthogenesis).

All intermediate types may exist. The main point is that slow and well-documented evolution shows a general trend from species of the first type to species more adjusted to an increased maturity.

LIFE TABLES

Differences between species are best described by survivorship or mortality curves. It is a fair generalization that species of less mature ecosystems or of lower trophic levels have a diagonal (sharply falling concave) survival curve but that species of more mature ecosystems or of higher trophic levels tend to have a rectangular curve. The curves differ not only in shape but also in total dimension, since species of more mature ecosystems may have a longer life. Distribution of the reproductive period over the life-span may also be typically different (Fig. 11).

What has been said before can be expressed in another way as a trend in the evolution of the shape of survivorship curves; the slope decreases over most of the range and the sharp drop at the end of the rectangular curve appears and may be shifted. Decreasing the slope of the curve means a reduction in mortality. Protection of young, larger size, low metabolism, development of defensive mechanisms, and passage from an indiscriminate type of feeding to a more selective one all contribute to the decrease in mortality rate and longer life. The fight to eat and not to be eaten, coupled with increase in size, often involves change in trophic level and is a part of this trend.

It is not by chance that all the most advanced examples of defense — mimicry, animal poisons, elaborate symbiotic relations, and complicated territorial behavior — are more frequent in the most mature ecosystems. They characterize the coral reef in the sea and the tropical rain forest on land. The cause is not the "life-promoting force of the tropical sun," but a long evolutionary opportunity in a very mature ecosystem. In other very mature systems in rather cold environments, evolution has been going on in the same direction: abyssal benthic fauna is composed of large-sized, sparsely diffused species with low metabolic rates, slow reproduction, elaborate ways of protecting offspring, and so on, as is typical of species in the tropical rain forest. The same can be said of true cave communities, including, for instance, beetles with long lives, low metabolism, and small numbers of descendants born at a very advanced stage of development.

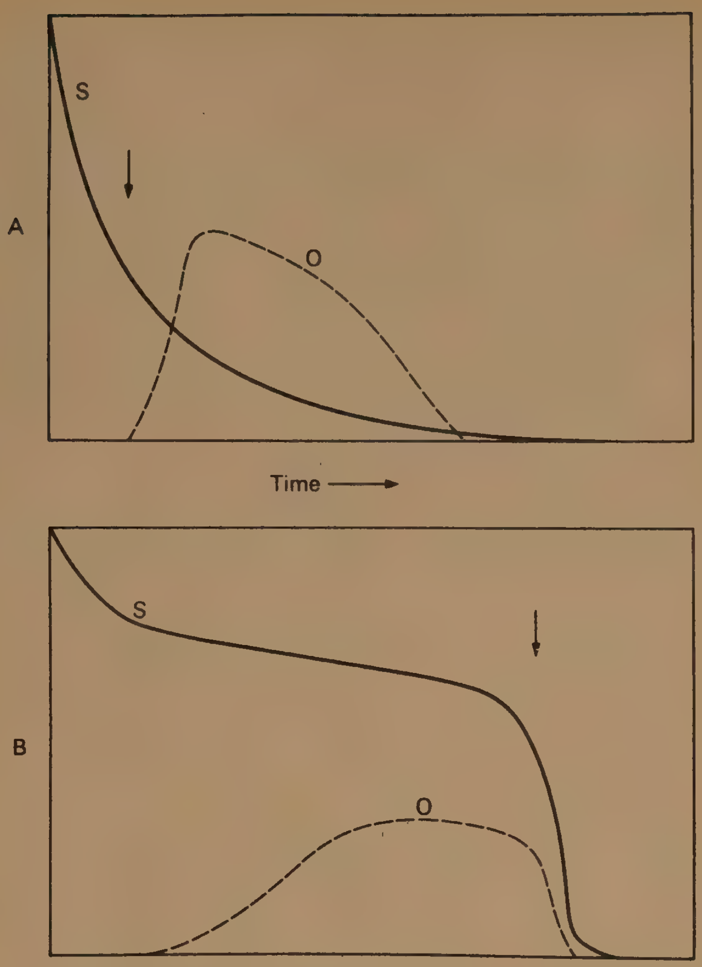

Fig. 11. Survivorship curves (*S*) and age-specific fecundity curves (*O*) for two idealized species: *A*, a species of an ecosystem of low maturity or of an inferior trophic level, and *B*, a species of a system more mature. The arrows indicate the ages at which natural selection is stronger.

The rectangular survivorship curve indicates a rather strong physiological limitation of life-span. The trend toward immortality must have limits, and should not be pursued immoderately. Such a rectangular curve conforms to the theoretically most efficient link in a food chain, in which prey is eaten just when it is about to die naturally (Slobodkin 1961).

The high mortality represented by a diagonal survivorship makes more deaths available for the workings for selection; thus, evolution can proceed faster in systems of low maturity.

The points of maximum mortality in the survivorship curve are the ages at which the weight of natural selection is most important. In the rectangular curve natural selection works at the end of the determined life-span, perhaps lengthening life or delaying the reproductive period; this causes elaboration of characteristics associated with later stages of life (telomorphosis). On the other hand, in species where the highest mortality is concentrated in younger stages, selection must operate in these stages. Remember that in populations of species spread over systems of heterogeneous maturity, younger stages are associated with the less mature segments, where they are subject to many factors of mortality.

Selection in species with diagonal survivorship curves most probably favors precocity in reproduction, which compensates for the small number of individuals that are preserved in later stages of development. Perhaps such older stages are dispensable; this would shorten life. At least, this must happen often under some changes in environment. This condition is called 'neoteny'. Associated with neoteny are parthenogenesis and other forms of nonsexual multiplication, which are frequent, for instance, in parasites.

The planktonic appendicularia and salps are probably neotenic forms of sessile tunicata, as cladocera may be neotenics of conchostraca. In algae, the morphologic series from flagellate cells, which pass through gleocapsal, cellular, and filamentous types (linked with the passage from planktonic forms to benthic ones and repeated in different groups), exemplifies a regular trend in evolution. Under certain conditions, regression from a filamentous or a sessile stage to free-swimming forms, as in *Prasinocladus*, may be considered neoteny.

Changes that impose a regression of ecosystems to a less mature stage, or the opening of new spaces to colonization, create new opportunities for the development of new species; such evolution does not take a slow and regular path but proceeds through neoteny or other nonhabitual or poorly understood evolutionary paths. In the words of Beer (1961), the energy made available by the disturbance is used to make evolutionary advances.

CLIMATE AND EVOLUTION

To add a geographical dimension to the picture, it can be said that in a rather constant climate ecosystems can attain stages of high maturity whereas areas subjected to fluctuating climates may have experienced destruction of well-organized ecosystems. In the latter, new lineages may arise by neoteny or other more or less heterodox evolutionary mechanisms. Climatic fluctuation in this context refers to longer periods than the yearly cycle. Glaciated areas are, for instance, an example of fluctuating climate.

Speculation about such possible relations between climates and evolution is not new. Mathew (1915), in a long paper titled "Climate and evolution," and Taylor (1934), writing with more concrete reference to human evolution, assumed correctly, I believe, that important evolutionary changes occur in areas of climatic fluctuation and then spread peripherally toward more stable climates where the lines are caught in the general trend of slow evolution. The tropical belt may not necessarily be a source of new lines but rather a refuge of types that have originated elsewhere and then migrated. On this point there is no agreement because certain distinguished biogeographers believe that the tropical zone has been the place of origin of many groups. It must be recognized that in mature environments some evolution may take place against the general trend (in the direction of increasing energy flow), either in the colonization of small subsystems of low organization (soils, interstitial water) or by rejuvenation under pressure of exploitation exerted by other trophic levels.

But it is difficult to understand how species adapted to systems of low maturity can arise in large numbers in a place from which old mature ecosystems have not been wiped out and where there is no stimulus in the form of environmental change forcing energy through the system and making it available for evolution. I must confess again that I am much in sympathy with Mathew's hypothesis.

MAN AND EVOLUTION

The appearance and evolution of man and his cultures were probably assisted by fluctuating climates, maintenance of systems at a low maturity by fire and other means, and by the poor exploitation of the plant resources implicit in the exceedingly low ratio of animal biomass to plant biomass in terrestrial ecosystems. Probably some neoteny associated with the reduction of maturity was involved since man remains, in general, a being adapted to rather low maturity systems, although differences exist among the prehuman and human groups.

The evolutionary play was going on in the evolutionary theater when as a part of the plot men entered, romping and stamping on the stage and bringing it almost to the point of collapse. The feedback between ecosystems and evolving species is obvious in the relations between man and nature. The second part of the circuit involves the impact of man on nature. In a previous chapter the consequences of human action have been described as a reduction in the maturity of ecosystems. Man is pumping energy through the ecosystem, thus rejuvenating the entire biosphere and opening new opportunities for evolution. The evolution of man has not been in the direction of passive adjustment to more mature ecosystems but is actively sustained through a regression of the rest of the biosphere. In this sense, technology and modern life are very wasteful. The amount of energy used to preserve a unit of human biomass seems to be increasing, but perhaps the amount of energy used to preserve a unit of information does not increase so much. Man is a historical accident, the creator of a stress that cannot be ironed out in the proposed model of succession and evolution. In this sense he is comparable to the development of trees with almost indigestible trunks.

THE TRIPLE CHANNEL OF TRANSMISSION OF INFORMATION

Now I want to go back to the first chapter and the subject of nature as a channel of information. Only a universe of energy could have no past. If there is matter, structures grow and differentiate and a past can be recognized and partially reconstructed. It is the problem of durationless nonmatter versus enduring matter (Fokker 1966). At one end of the spectrum is biblical chaos, a past without a past, because no matter exists to convey information. At the other end there is only information and no decisions — static information forever. We and the entire universe are caught in between, with the wonderful opportunity to enjoy creation. Some sophisticated people would rather speak of existential anxiety, but biologists in general and field naturalists in particular are really childlike and enjoy nature like a child playing in a mud puddle after the rain has given way to sunny skies.

A closer examination of the ecosystem, considered as a channel of information, allows one to separate three different layers, or subchannels. One is a genetic channel in replicable individual structures. Another is a truly ecological channel based on the interaction between different cohabiting species and expressed in the relative constancy or in the regular changes of their numbers. This channel is the one continually referred to throughout this book. A third channel may be called 'ethological' (because ethology is the science of animal behavior) or 'cultural'; it transmits what has been learned by individual activity or experience and is transmitted to future generations outside the genetic channel. This last channel had a negligible importance at the beginning of life but it is now increasing explosively. In it can be placed: formation of trails and burrows that are used by other individuals, accumulation of dead material, imprinting, imitative collective behavioral memory and formation of local traditions, and the legacy of tools and all cultural manifestations in man. Indulging in a figure of speech, one can say that it runs from the dead wood in the forest that preserves a structure to the wood transformed into paper in our libraries that preserves culture. And as books usually contain more information than tree trunks (or at least more readable information), it is clear that the conversion of trees into books will go on for some time.

An interesting subject of speculation is to estimate how the total information transmitted to the present time in the biosphere has been distributed in the three channels. Otherwise the separation of the three channels is devoid of interest.

"As books usually contain more information than tree trunks, . . . it is clear that the conversion of trees into books will go on for some time."

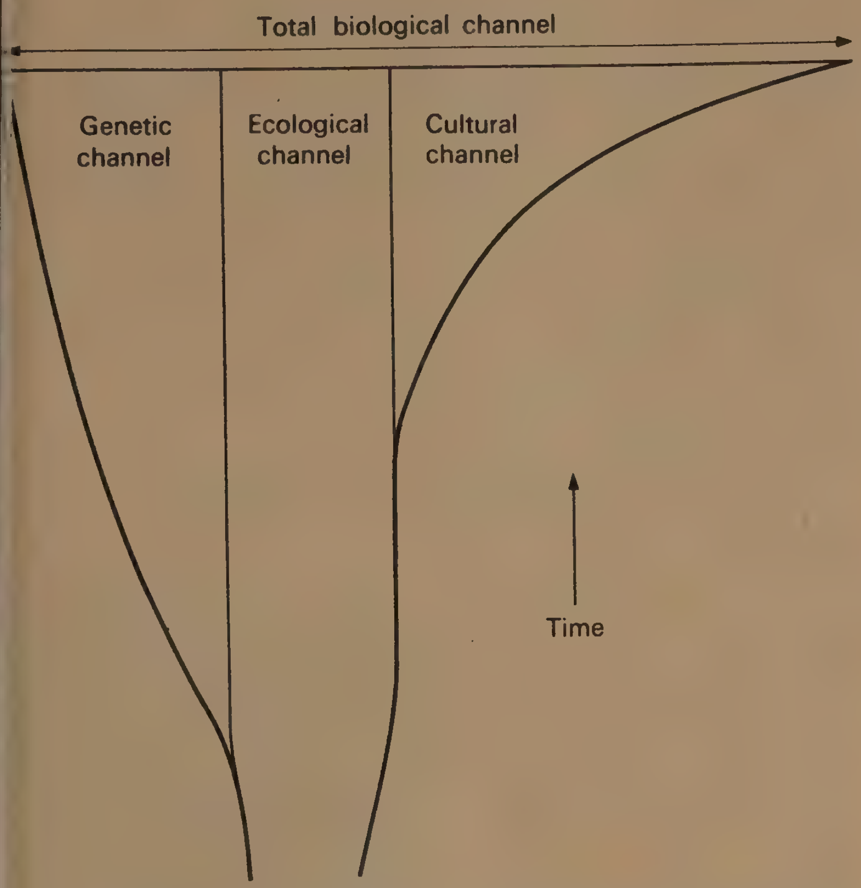

Fig. 12. An idealized view of distribution along time of information forwarded by life, in three channels.

The feedback circuits formed by interaction between species are a very expensive memory with a relatively limited capacity for storage. At the ecological level, contemporary forests do not convey much more information than mesozoic forests. Climatic fluctuations and other changes in the conditions of life have forced succession to start again and again in different places, and old information has not been saved in the form of feedback circuits in ecosystems; rather, species have been replaced by others and the ecological memory seems always to have played the role of an auxiliary memory of rather limited capacity. The opposite is true of genetic information. Although sometimes latent for long periods of time, it has preserved increasing amounts of structure able to influence the future. The genetic channel has undoubtedly enlarged more rapidly than the ecological channel. Surely the cultural or ethological channel has become tremendously enlarged with the development of higher vertebrates, and its increase reaches the proportions of an explosion with the advent of man. Now, if we project the relative size of the channels back in time (Fig. 12), the total channel is like a fan divided into three unequal parts: an ecological channel enlarging negligibly, a genetic channel enlarging considerably, and a cultural channel appearing later but enlarging explosively.

THE BEGINNINGS OF LIFE

If in the course of evolution the genetic and the cultural channels have increased in size more than the ecological one, there is reason to ask if perhaps, in the origin of life, the ecological channel was relatively most important. In other words, we may speculate about whether the mechanisms proper to the ecological channel — that is, feedback between separate entities increasing at different rates as a way to maintain organization — are not, in fact, the ones closest to life and its beginnings.

From all the speculations of different authors about the origin of living systems, one is led to conclude that such primitive systems were more comparable to ecosystems than to present-day organisms. By this I mean that primitive systems, before they possessed a mechanism of molecular copying based on nucleic acid chains, could preserve some organization through feedback between different parts of a chemodynamic machine. This involved a sort of circuitry not very different from the one existing today between the different species of an ecosystem. If so, every primitive living thing was at once unique and original, with almost no replicate parts, just like an ecosystem — with apologies to the systematic phytosociologists! That is, these systems had a structure perfectly adjusted to local properties of environment and everywhere adjusted to the locally available materials more than to the available energy. This is a matter of choice and opinion; the authors most popular today believe that solar energy was not necessary and that primitive life had the form of material systems competing for energy. I am more inclined to Needham's (1959) view that living systems have always been energetic systems competing for materials. The distinction is important because transmission of information is more closely linked to the possibility of organizing huge amounts of matter than to the possibility of letting through high amounts of energy.

The beginning of species and of evolution can be placed at the first moment when mechanisms of molecular duplication were effectively used. Huge amounts of information could be copied — copying is very important, for it is cheap, like printing — and distributed. Instead of slowly assembling again and again a different organization in every location, there was the possibility of putting together rapidly, at a low expense, equivalent systems made of prefabricated pieces — that is, individuals. A small assortment of such pieces (species) was necessary, some to serve as primary producers and others to close the cycle of matter, regulating the respective numbers by feedback circuits. Thus, the genetic channel was born and information started to flow from the ecologic to the genetic channel, where it was better preserved and transmitted.

The hypothetical organism-ecosystems of the beginnings of life were assembled in place, in perfect adjustment to local conditions and subject to slow change: succession and evolution were one. Later ecosystems were organized on the basis of prefabricated pieces, and the relative numbers of each component in the total system were regulated, as has been described. But with such a model of construction, adjustment to local conditions can never be total: with pieces cut to standard sizes it is not possible to cover exactly any arbitrary surface. The result is that all species in the frame of an ecosystem are subjected to some stress, at least to the stress resulting from the succession or self-organization of the ecosystem. In other words, the primitive organism-ecosystems were probably more flexible than contemporary ones and species could not be separated from the primeval 'soup' or 'cake'. The introduction of the relatively rigid mechanism of genetic transmission, a successful tool of life, led to the separation of species inside the broth.

A proper subject of ecology is the study of the increase and preservation of organization at the ecosystem level; the fashion of the times leads one to emphasize some aspects of cybernetics, information processing, and transmission. All of them are pertinent in speculations about the beginnings of living systems. ■

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> "There are material limits to growth.
> There are not spiritual ones."
>
> – *E.F. Schumacher, 1974*

Synergetics

Bucky once remarked that it would take him more than 50 hours to verbally tell all he had discovered. That lecture would doubtless have been delivered in his customary manner: too much too fast for many to integrate, much less contemplate. But at least it would have spared the audience the frustration engendered by his shorter talks and previously published books which were not of sufficient length to allow a complete presentation of the complex, interwoven logic underlying his ideas.

Synergetics *is that whole presentation. The disciplined editing of E. J. Applewhite has loosened the weave just enough to show the threads without disturbing anything. The result is highly refined Bucky; elegant, clear, and sometimes outrageous. The geometric proofs are there, of course, but I found the most exciting discussions to be those dealing with intuition, metaphysics and the possibilities open to humanity. Reading along, I got that same feeling of "dawning" that I can remember from first hearing him back in 1951, but without the uneasy aftertaste of insubstantial argument that you couldn't recheck later. (This book has numbered paragraphs for easy reference.) The careful unfolding of his thoughts reminds me of a flower blooming; an unfashionably hopeful voice these days.*

Friends will rejoice in what they find here. Foes will have to admit that Bucky has proved to be right often enough. History will probably regard this as one of the great books of our time.

— J. Baldwin

Synergetics
(Explorations in the
Geometry of Thinking)
R. Buckminster Fuller
1975; 876pp.

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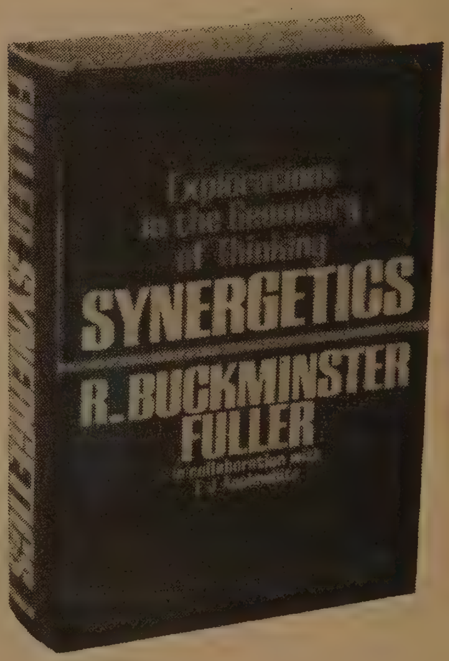

Universe is the minimum and *only* perpetual motion machine.

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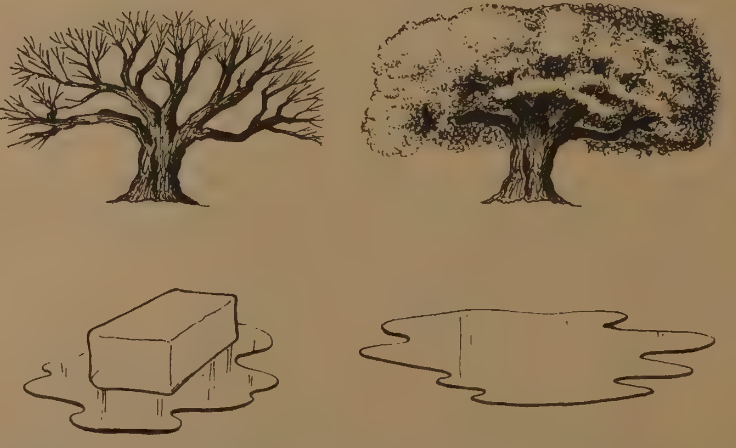
321.02 You cannot get out of Universe. Universe is not a system. Universe is not a shape. Universe is a scenario. You are always in Universe. You can only get out of systems.



Universe as "A Minimum of Two Pictures": Evolution as a transformation of nonsimultaneous events: the behavior of "Universe" can only be shown with a minimum of two pictures. *Unity* is plural and at minimum two.

Peter Kropotkin, Murray Bookchin, Ivan Illich

Mutual Aid, first published in 1902, is considered to be Kropotkin's classic. Kropotkin himself was a classic; a Russian prince abashed by the arbitrariness of his own privilege. After he'd done his stint as a page at the Tsar's court, when the time came for him to choose a regiment, he unfashionably headed for Siberia and became an explorer. His researches led him to a new concept of Asia's geography. Publication of his theory would earn him international scientific prominence. Another thing Kropotkin discovered in Siberia: anarchism – it was there he met Madame Bakunin, who introduced him to her husband's ideas.

After resigning his commission and retiring into scholarly penury in St. Petersburg, Kropotkin got into trouble with the Tsar for lecturing to gatherings of workers. For this he was jailed. Two years later a number of friends contrived an elaborate plan for a daring daylight escape and freed him. His flight took him through Switzerland and France (where he was jailed again), and finally to London, where he went to work for the magazine **Nature**.

In the late 'eighties the vulgarization of Darwin's thought into social Darwinism began to dismay Kropotkin. After having meditated on the evidence at length, he took to print to refute Huxley's image of nature as "a continuous free fight;" a Hobbesian "war of all against all." In **Mutual Aid** Kropotkin assembled evidence of cooperation in all animal societies, including man's. There are descriptions of animal behavior substantiating the notion that the survival of a species is often furthered not by internecine warfare, but by the banding together of its members for hunting, migration (which he perceived as a means of avoiding competition), and sociability. Kropotkin and the observers he quotes were anthropomorphising ethologists; their science was so new that it was unaffected by the quantification fetish; they were willing to interpret animal behavior in terms of feeling, even tender feeling. Sociobiology has been around for a long time.

If **Mutual Aid**'s ethological evidence seems quaint by today's standards, its re-vision of human history is illuminating, particularly the passages which deal with the history of medieval free cities. They were utopias, their infrastructures were shaped by craftsmen's ethics – guild charters; their citizens worked together in myriad ways to support the communes – not merely out of altruism or necessity. Decency just happened to be an elegant way of achieving homeostasis. It took considerable ruthlessness on the part of nationstates to subjugate these cities and destroy their wholesome autonomy.

So **Mutual Aid** is a motherlode of neglected history. As Rock Man says in Nilsson's TV story "The Point": "You see what you want to see and you hear what you want to hear." Kropotkin found more in human history than strife and aggression. Nice vision. Worth tapping into.

Murray Bookchin, a venerable and visionary radical, is an intellectual heir to Kropotkin. It's not pure coincidence that one of his most prescient books should have to do with man in nature. **Our Synthetic Environment**, first published pseudonymously in 1962 lavishly details the ecological cost of capitalism. It was completely upstaged by **Silent Spring** six months later. Perhaps Bookchin's wider range of concern put people off, or perhaps his quiet prescription of social revolution as the remedy for the problems he detailed was too much for people to swallow in '62.

By now we've all heard about these problems. However, since most of them have yet to be solved and are, in fact, worsening steadily, **Our Synthetic Environment**, thirteen years old, is as useful and comprehensive a sourcebook as ever.

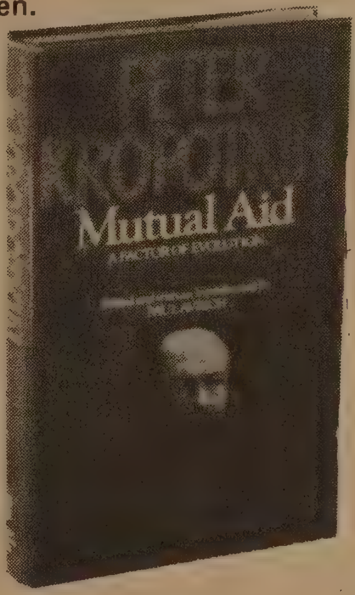
Man is the focal point of Bookchin's concern. He deals with the effects of environmental deterioration on human health first, then worries about the abstraction of biospheric integrity, since it turns out that we're just as good at being canaries-in-a-mineshaft as canaries are. Better even, because we're the creatures who can act to stop assaults on the ecosystem. The action Bookchin suggests is decentralization and the development of liberatory technology – a post-scarcity version of Kropotkin's medieval utopias.

Ivan Illich's **Medical Nemesis**, hot off the press, picks up Bookchin's thread of concern with human health and the understanding that "illness" is often the unforeseen result of social decisions. High tech medicine is making us sick, not well, and the essence of that sickness is passivity. Overblown industrialism shames traditional methods of healing, education, locomotion and social organization. Exporting the monster model plunges traditional cultures into a hopeless abyss of underdevelopment and condemns them to ecological insanity. Human abilities to self heal, indeed to self sustain, have been traded off for or expropriated by Big Brother's quasi-benevolence. Illich, fatalistic, says that to regain control of our health, we will have to re-learn how to suffer pain; to regain our autonomy we'll have to forfeit our "envious, greedy, and lazy" dreams.

Illich, too, is a fierce revolutionary; not so idealistic as Kropotkin, nor as hedonic as Bookchin. It's late in the game, and his tone is shrill. The voice offstage in each of these books calls for an erosion of agglomerations of power, for the redistribution of gross concentrations of wealth. But none of these authors is naive enough to suggest that Political Planning could accomplish that, nor are they desperate enough to imagine that the State can do anything but accelerate Nemesis.

They see humans as responsible, capable, even co-operative, given conducive circumstances, namely decently scaled communities beyond the reach of centrist meddling: anarchism. Amen.

— Stephanie Mills



Mutual Aid: A Factor of Evolution
by Peter Kropotkin, Edited and with an Introduction by Paul Avrich.
1972; 273pp.
$2.00
from:
Porter Sargent Inc.
11 Beacon Street
Boston, MA 02108
or Whole Earth

Medical Nemesis: The Expropriation of Health
by Ivan Illich
1975; 183pp.
$2.86
from:
Calder and Boyars Ltd.
18 Brewer Street
London, W1R 4AS, England
or Whole Earth

Our Synthetic Environment
Revised edition by Murray Bookchin
1974; 305pp.
$2.95 postpaid
from:
Harper & Row
Keystone Industrial Park
Scranton, PA 18512
or Whole Earth

The absorption of all social functions by the State necessarily favoured the development of an unbridled, narrow-minded individualism. In proportion as the obligations towards the State grew in numbers the citizens were evidently relieved from their obligations towards each other.

– Peter Kropotkin

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Increasing and irreparable damage accompanies present industrial expansion in all sectors. In medicine these damages appear as iatrogenesis *[disease caused by treatment]*. Iatrogenesis is clinical when pain, sickness and death result from medical care; it is social when health policies reinforce an industrial organization which generates ill health; it is structural when medically sponsored behaviour and delusions restrict the vital autonomy of people by undermining their competence in growing up, caring for each other and aging, or when medical intervention disables personal responses to pain, disability, impairment, anguish and death.

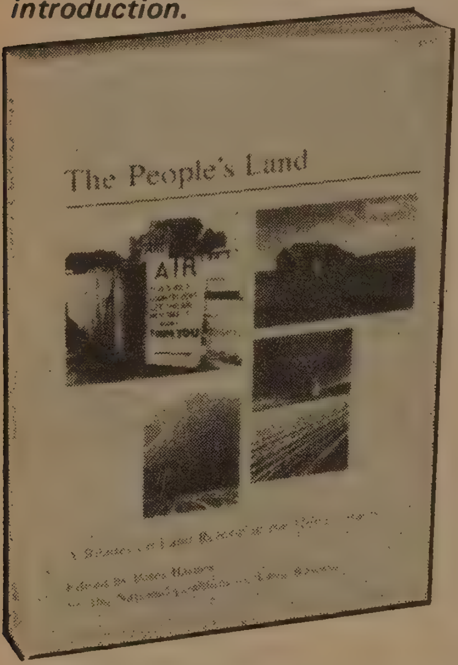
– Ivan Illich

Land Use

The People's Land

Land reform is a term most of us connect with Latin America or Asia — an attack on a last vestige of modern-day feudalism. Believing that has been useful for maintaining the status quo in this country, and since most of us live in cities anyway, and don't know what goes on on "the land", it has worked all too well. Land reform and a few other chickens are finally coming home to roost. This collection of 42 short pieces and some fine photography is an excellent introduction.

— Richard Nilsen



The People's Land
(A Reader on Land Reform in the United States)
Peter Barnes, editor
1975; 260pp.

$6.95 postpaid

from:
Rodale Press, Inc.
Book Division
33 East Minor
Emmaus, PA 18049
or Whole Earth

The object of land reform is not merely to alter and control land *use*, but to alter and control land *ownership*, for it is the latter that inevitably determines the former. It is ownership — and the economics surrounding ownership — that determines whether land is farmed or paved, strip-mined or preserved, polluted or reclaimed. It is ownership that determines where people live and where they work. And, to a great degree, it is ownership that determines who is wealthy in America and who is poor, who exploits others and who gets exploited *by* others. . . . a mere five percent of the population probably owns close to two-thirds of the private property in America.

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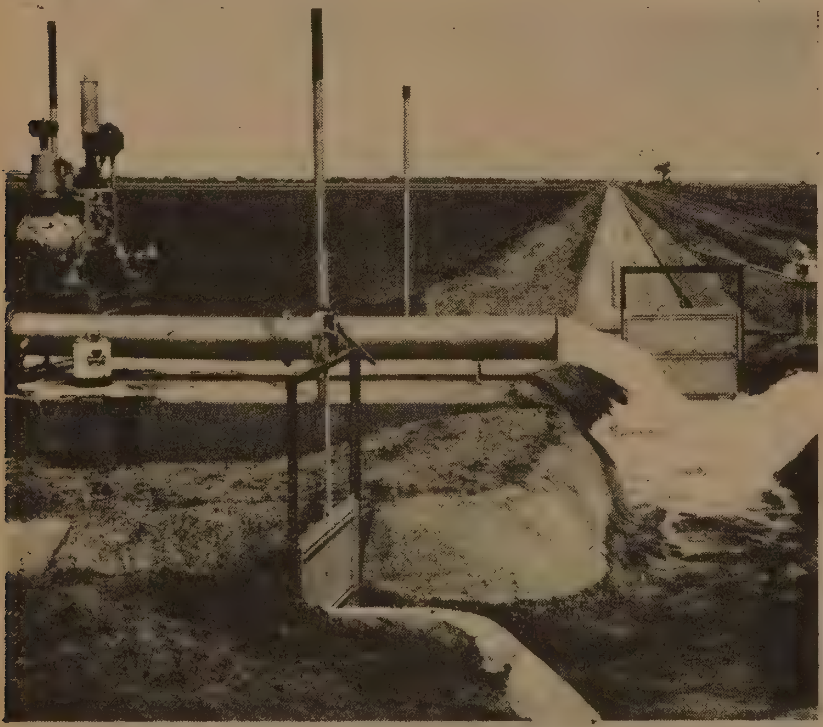
In all, blacks managed to become full or part owners of 15 million acres of Southern land by 1910 without benefit of the Homestead Act and in the face of great hostility and violence.



Four-thousand-gallon-per-minute irrigation well; Colorado, 1967.

But that was the peak. By 1950, black land ownership had declined to 12 million acres, and in 1969 it was down to 5.5 million acres, a drop of 54 percent in twenty years. It is probably accurate to say that white people own more of North America today than at any time in history, and this percentage continues to rise. Meanwhile, black Americans, whose stake in the United States is tenuous at best, are rapidly losing title to what little land they do have.

•

The only effective barrier to the industrialization of food is consumer action. Family farmers are already in the fight, but they are reduced — by lack of power — to waging a defensive battle. Real power rests with consumers. They must recognize their stake in family agriculture and wage a major food offensive.

Congressional power today is in urban hands. Those voters will determine the direction of agricultural policy. As desperate as it may appear, big city Congressmen represent the last exit off the road to corporate farms and food.

•

. . . the withdrawal of cheap supplies of irrigation water comes at a time when U.S. agriculture should be coming to grips with the rapid depletion in its stocks of fossil water as well as fossil fuel. At present the U.S. is using twice as much water from groundwater reserves as is being naturally recharged into these reserves.

•

If the production of agricultural goods is to become increasingly large-scale and corporation-dominated, rural communities as we have known them will cease to exist. Instead, the landscape will be dotted by what can be called company towns, made up of workers and overseers, together with such service personnel as the company chooses not to provide itself. Lacking any orientation to community and other sense of social belonging, the farmworker will find his interests increasingly identified with his union. In fact the absentee and corporate owners will favor the unions because they will find, as industrialists readily do, that this makes for easier management.

A Bibliography on Land Reform in Rural America

This could be very useful for zeroing in on what's been written about agriculture and land in your state. Or for zeroing in on the field of rural studies, which more libraries should start doing. Several hundred books and articles listed here, and cross-referenced.

— *Rosemary Menninger*

A Bibliography on Land Reform in Rural America
Charles L. Smith
1975; 47pp.
$1.25 postpaid

from:
Center for Rural Studies
1095 Market St., #418
San Francisco, CA 94103

352. Historical Records Survey, WPA. Spanish Land Grants in Florida. Tallahassee: State Labor Board, 1940. 5 vol.

358. Hoffsommer, Harold. The Social and Economic Significance of Land Tenure in the Southwestern States: a report of the Regional Land Tenure Research Project. Chapel Hill: Univ. of North Carolina Press, 1950. 666 pp.

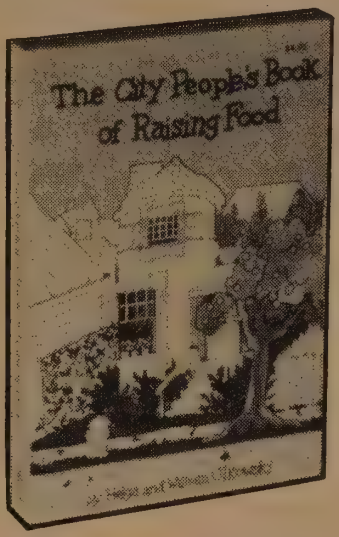
369. Houk, Kemp. Concentrated Land Tenure in Kansas in the 1960s. Kansas Farm Project, Box 362, Lawrence, Kansas 66044. 27 pp. $1.

414. Judson, Katharine Berry. Early Days in Old Oregon. Chicago: A.C. McClurg & Co., 1916. Binfords.

The City People's Book of Raising Food

The best book around for people who have never gardened before. The interrelationship of plants, insects, soil, weather and gardener is explained as an ecosystem. Manipulating that ecosystem is a matter of common sense, and the book gets that across too. Their tricks of city self-sufficiency are a launching pad to help gardeners develop their own methods.

— *Rosemary Menninger*



The City People's Book of Raising Food
Helga and William Olkowski
1975; 213pp.
$4.95 postpaid

from:
Rodale Press, Inc.
Book Division
33 East Minor
Emmaus, PA 18049
or Whole Earth

Here are some approaches to making the best use of whatever small amount of space you may have.

1. Start your seedlings indoors, if possible. Chapter 8 tells you how. That way, space will not be taken up in the garden by plants during their first weeks of life when they can do just fine on the window sill. This is particularly important in those parts of the country where a long growing season means that several crops can be harvested in a single season.

2. Plant "cut and come again" vegetables. Once the plant has become established, loose-leaf lettuce and sprouting broccoli will continue to furnish small amounts of harvest every few days over a long period of time. In the same amount of ground space pole beans or peas will many times out-produce their bush-type relatives. Jerusalem artichokes, besides being generally more indestructible than potatoes as plants, will yield many times the amount of tubers in the same depth of soil. They can be prepared in all the ways that potatoes can, besides being edible raw in salads and a nice substitute for crisp water chestnuts in Chinese dishes. They are also good for the dieter who is avoiding extra calorie intake. Compact varieties of winter squash (grown in the summer and, because of their thick water-repelling skins, stored for winter eating) form a bush that will give you the same amount of food close to the main stem that older varieties will produce while sprawling over many square feet of precious ground. Golden Nugget is one such variety. A careful reading of the seed catalogs will alert you to the most compact varieties of the vegetables you have chosen to grow.

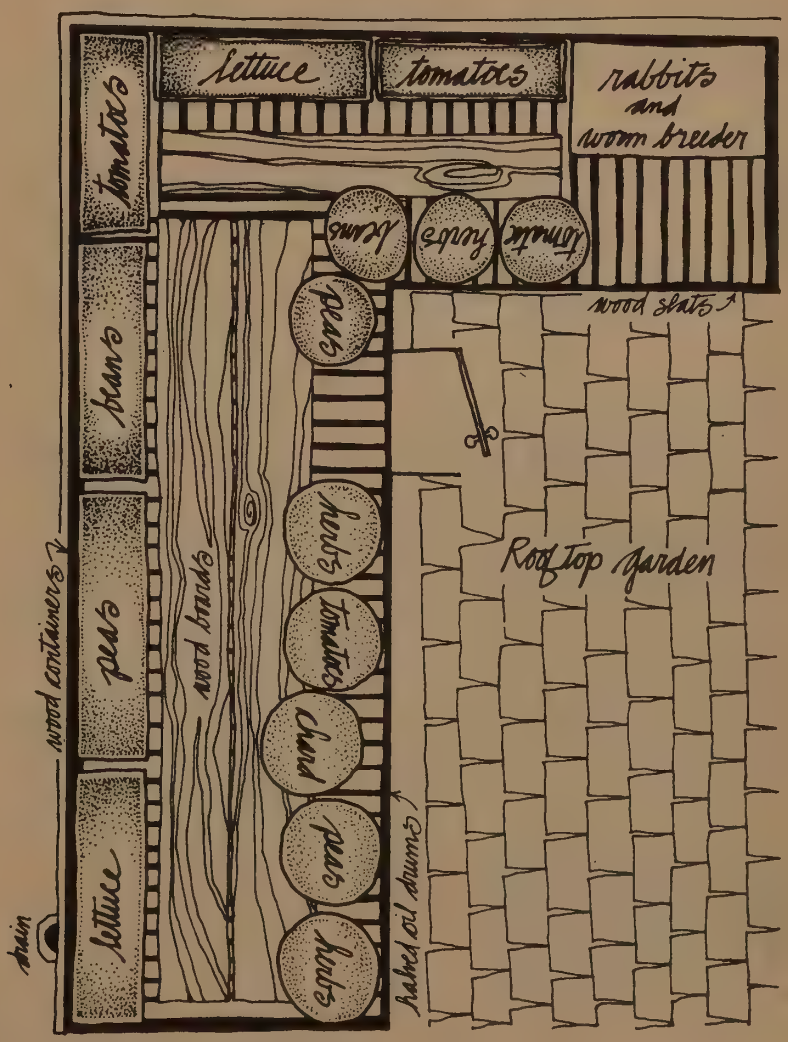
3. Make use of or build structures that take advantage of vertical space. Cucumbers, squashes, tomatoes, peas, and beans can all be made to grow up if they are adequately supported. As large, heavy winter squashes form, they may need additional support.

Strawberries can be grown in "step" containers. This makes it possible to set many plants in the same ground area while still providing adequate root space. The berries are kept drier and are less subject to rot and attack by pests. Harvest is easy and the runners can be managed very well in this arrangement.

4. Where you have no open ground, use containers on patios or the roof, on shelves or tables inside the house in a sunny window. Some plants will do particularly well this way. Summer squashes, for instance, seem to thrive under conditions that simulate the arid Southwest where bitter wild squashes still live. Give them a roomy container so that their roots can enjoy moisture at the same time the vines trail over a hot, dry surface. A friend's bumper crop of zucchini was grown in an old double washtub set in one corner of a cement parking area.

5. Interplant slow-growing vegetables with those that will be harvested in a short time. Radishes, turnips, and lettuce will be gone before corn or cabbage becomes large enough to use all the ground space it ultimately needs. The seed catalogs usually tell you the approximate time to maturity of each variety. Although the actual number of days to harvest will depend largely on the weather, the relative times between varieties will be a good guide to learning which vegetables to interplant with which.

6. Plant tall things at the north side of your spot so that you do not lose growing space to unnecessary shading.



Community gardening

When I started working in community gardening, about two years ago, I wasn't much interested in it. But it seemed like something a lot of people would be getting interested in, and I thought I might be one of them.

Since then, community gardening has become an exciting political movement, and one in which many of the leaders are women. As a recreational, spare-time activity (with definite kitchen connections), it is automatically accessible to women, and therefore considered uncontroversial.

This non-threatening image gives gardening a lot of options, and an astonishing variety of programs are springing up. They develop around the particular resources of each community. Generally, they get government, businesses and institutions cooperating with people on sharing free land, food, labor and machinery. All sorts of radical ideas, when coupled with gardening, become politically plausible.

In California, I know of no two programs alike: San Francisco just hired 20 garden managers to start public school gardens that will hopefully involve and help feed the surrounding neighborhoods. In Fresno, a proposed freeway lost its funding and is being plowed for gardens. San Jose has a small program that grows free food for women who are poor and supporting families.

These gardens are not basically plants, they're basically people, who create them and are their biggest pests. Aphids and snails don't ravage a garden the way disorganization and discouragement can.

The traditional Victory-type gardens — where individual families rent individual plots — have the least trouble with this. There has been a cash outlay, and everyone has their own land just as though it were a back yard.

At any point where possession is replaced with cooperation — say, in the sharing of tools — hassles can erupt that test the strength of a garden's organization. I've seen racial land wars in a senior citizens' garden that were like a living chess game, but they eventually calmed down and were undoubtedly educational.

The more cooperation, the more education will result, and the greater the need for leadership. The ambitious gardens — those with poor people who are harvesting food, those with rich people who are discovering an old art and spirituality, those with wealthy organizations that share their land — are generally not doing as well as the newspapers say they are. It is those gardens that need at least part-time managers, and therefore money.

So far, all levels of government have been proud of how much community gardening programs have done with practically no money; and the programs are proud of it too. But I think in the next year gardening savvy and fund raising will increase, as humble gardeners begin to see the power they have — in their own lives from growing the food they eat; and in their communities, which they as gardeners are changing.

Government is just beginning to put money into gardening through Public Works jobs. The practically dormant Agricultural Extension Service may arise with urban agricultural agents and programs to further assist city gardens, as they did for the farms of the 30's.

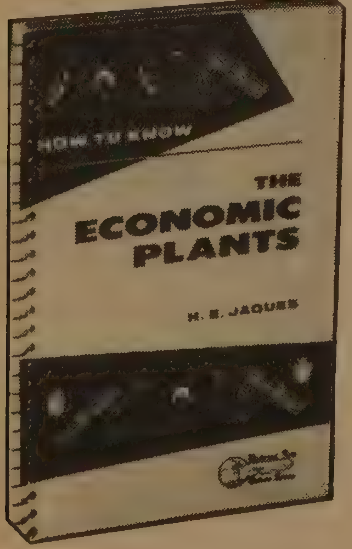
A good way to tap into those jobs as they come along is to tie in with a community garden now. I know of no book that is right on community gardening; maybe it's still too early. But these books all offer information that is relevant to starting a garden or a program now.

— Rosemary Menninger

How to Know the Economic Plants

What's green and makes your hair red?
What member of the sorghum family is used to sweep the floor?
Henna, and broom corn.
This book is an herbal for more than herbs. It's got uses and some cultivation of all kinds of plants used by man, keyed for nature-walk identification.

— Rosemary Menninger



How to Know the Economic Plants
H. E. Jaques
1958; 164pp.

$3.50 postpaid

from:
Wm. C. Brown Co.
2460 Karper Blvd.
Dubuque, IA 52001
or Whole Earth

35c Thick young stems used for food. Older plants, tall, much divided with small, yellowish lily-like flowers and spherical fruit (red when ripe). Fig. 54..
...................GARDEN ASPARAGUS *Asparagus officinalis* L.

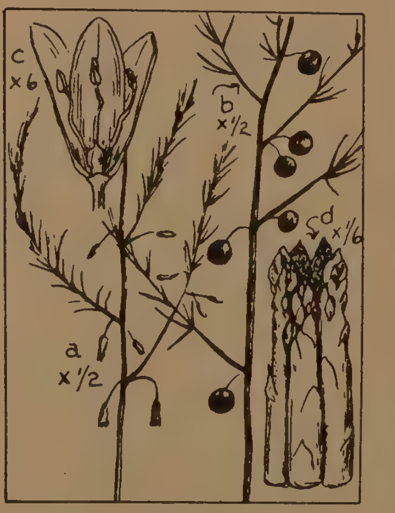


Figure 54

a, small branch of plant with flowers; b, branch with fruit; c, section of flower; d, "spears" as cut for market.

Asparagus over-winters as a mass of fleshy underground stems (rhizomes) at a depth of several inches. The mature plants are much branched with fine linear leaves and attain a height of 5 to 6 feet. The flowers are tiny, hanging and tulip-shaped, for this plant belongs to the Lily family. Their color is yellowish. The fruit is a berry, scarlet at maturity.

The fleshy young sprouts or "spears" are cut close to the ground when they have attained a height of 4 to 8 inches and bunched for marketing or canning. It is a native of Europe where a beverage is made from the ripe fruit and the seeds sometimes serve as a substitute for coffee.

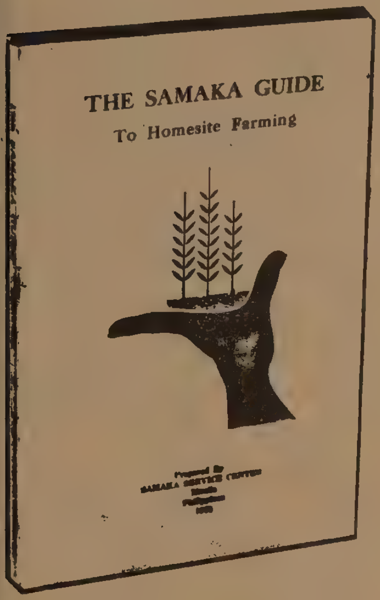
The Samaka Guide to Homesite Farming

Written for the barrios in the Philippines, this is the only community gardening guide I've seen that is directed to poor people. The few American books do not cover, as this does, urban livestock, fish farming, or how to make your own tools; in short, subsistence agriculture in town.

So this modest book that was first printed 20 years ago is ahead of its time here. In gardening techniques it's precisely on time — phasing out of chemicals because they're too expensive.

The idea behind the book was to encourage agricultural workers who lived in town to combine their back yards for their own food production. Some American towns with farm labor populations are beginning to try the same. But things have changed in the Philippines: over the past 3 years, the Rockefeller Foundation has changed small farming there into streamlined rice production.

— Rosemary Menninger



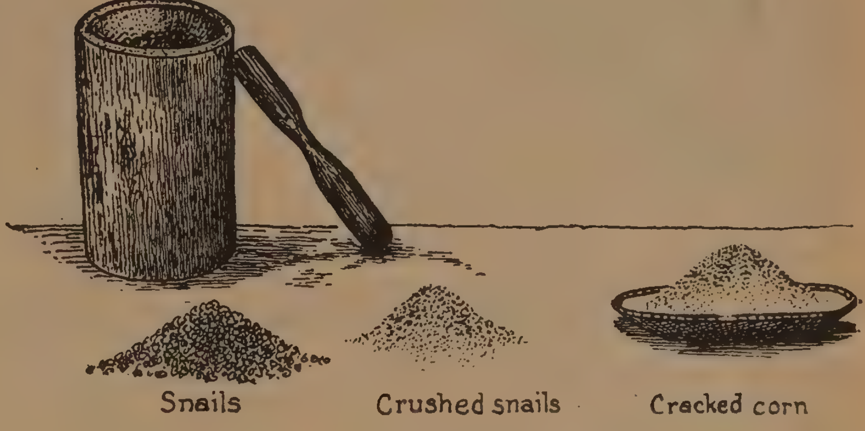
The Samaka Guide to Homesite Farming
Colin M. Hoskins
1954, 1973; 173pp.
$4.00 postpaid
from:
Samaka Service Center
P.O. Box 2310
Manila, Philippines

If our leader is a good one, he will be spending too much time helping us, so that he will not be able to give enough time to his own SAMAKA garden.

It is therefore the obligation of each SAMAKA farmer to pay for our leader's time, not with money, but by giving him an hour or two of labor in his garden, equal to the time and effort he is giving us. This is something like the "bayani" system we all understand.

•

If there are plenty of pieces of *dead* grass and weeds on top, let us leave them there. They will soon rot and make the soil richer. We should remove only living weeds and large pieces of trash, and put them in the compost pile, which we will discuss later, or feed the weeds (with earth attached) to the pigs.

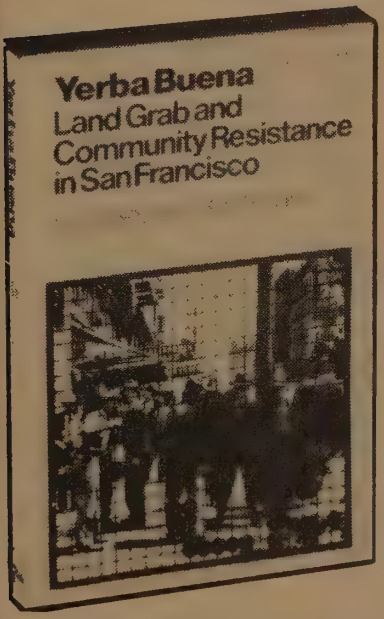


Mortar and pestle can be used for grinding snails and corn to mix with darak for homemade poultry feed.

Yerba Buena

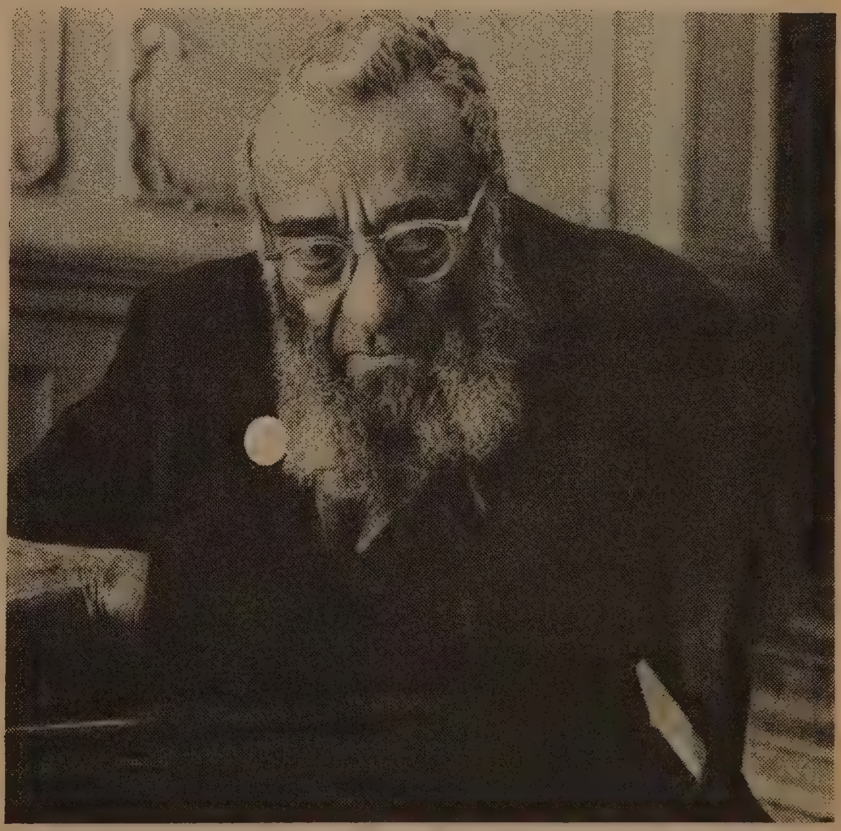
Redevelopment agencies around the country own lots of land, and urban renewal is already slowing way down. In some cities, Redevelopment has cooperated with gardening programs on its unused land. They are powerful bureaucracies with some strange ideas, and while this book is simply a case study of an area in San Francisco, it shows tactics and background for recycling Redevelopment.

— Rosemary Menninger



Yerba Buena
(Land Grab and Community Resistance in San Francisco)
Chester Hartman
1974; 228pp.
$4.95 postpaid
from:
Glide Publications
330 Ellis
San Francisco, CA 94102
or Whole Earth

For the many retired trade unionists living in the area, organizing their fellow residents against the bulldozer harked back to organizing efforts in building the labor movement three and four decades back.



"I've lived my life so that I can look any man in the eye and tell him to go to hell."

— George Woolf, chairman of TOOR (Tenants & Owners in Opposition to Redevelopment)

Improving Garden Soil With Green Manures

Green manure is what you get when you grow a leafy crop and then plough it all back into your soil — the plants convert the sun's energy into organic matter, and your soil gets the benefits when it decomposes. It's all explained in this handy booklet.

— Richard Nilsen

Improving Garden Soil With Green Manures
(A Guide for the Home Gardener)
Richard Alther &
Richard O. Raymond
1974; 44pp.

$2.00 postpaid
from:
Garden Way Publishing
Charlotte, VT 05445
or Whole Earth

Buckwheat — the abundant, fast-growing green manure. Here is how your garden, or a portion of it, can look in just a few weeks after sowing buckwheat. Needless to say, there's no room left for weeds. It's important to cut down or till under the buckwheat before the formation of new seeds, which would continue the buckwheat's growing cycle the following season. Also, the stalks while green and still tender are more readily available as nourishment for the soil life than if they became yellow and tough.

CHART OF GREEN MANURE INFORMATION

Common Name		Legume	Soil Preference	Lime Requirements (Low, Medium or High)	Adapted to Soils of Low Fertility	Relative Longevity of Seed	Seeding Rate (lbs. per acre)	Seeding Rate (lbs. per 1000 sq. ft.)	Depth to Cover Seed	Areas For Which Best Adapted: N.E. and N.C. States	Southern and S.E. States	Gulf Coast and Florida	Northwestern States	Southwestern States	When to Sow	When to Turn Under	Comments
Barley		No	Looms	L		Long	100	2½	¾	●			●	●	Spring Fall	Summer Spring	Not good on sandy or acid soils. Sow spring varieties in north, winter varieties in milder climates.
Beans	Mung	Yes	Widely Adaptable	L	●	Short	70	2	1		●	●		●	Spring or Summer	Summer or Fall	Warm weather crops. Do not sow until ground is warm and weather is settled.
	Soy	Yes	Loams	M		Short	90	2½	1½	●	●	●	●	●	Spring or Summer	Summer or Fall	
	Velvet	Yes	Loams	L	●	Short	120	4	2			●			Spring or Summer	Summer or Fall	
Beggar Weed		Yes	Sandy Loams	L	●		15	½	½			●			Spring or Early Summer	Summer or Fall	Seeding rate is for scarified seed. Treble the amount if unhulled seed is used
Brome Grass, Field		No	Widely Adaptable	L		Long	30	1	½	●					Fall Spring	Spring Fall	Good winter cover. Easy to establish. Hardier than rye. More heat tolerant.
Buckwheat		No	Widely Adaptable	L	●		50	1½	¾	●			●		Late Spring and Summer	Summer or Fall	Quick growing. Plant only after ground is warm.
Bur Clover		Yes	Heavy Loams	M		Long	30	1	½		●	●	●	●	Fall	Spring	Not winter hardy north. One of the best winter crops where mild winters prevail.
Chess or Cheat Grass		No	Loams	L		Long	40	1	¾					●	Fall	Spring	
Clover	Alsike	Yes	Heavy Loams	M		Long	8	¼	½	●			●	●	Spring Fall	Fall Spring	Less sensitive to soil acidity and poorly drained soils than most clovers
	Crimson	Yes	Loams	M	●	Medium	30	1	½	●	●	●	●	●	Fall Spring	Spring Fall	Not winter hardy north. A good winter annual from New Jersey southward.
	Subterranean	Yes	Loams	M		Medium	30	1	½		●	●	●	●	Fall	Spring	
Corn		No	Widely Adaptable	L		Medium	90	2½	1	●	●	●	●	●	Spring or Summer	Summer or Fall	Do not sow until ground is warm
Cow-Pea		Yes	Sandy Loams	L	●	Short	90	2½	1½		●	●		●	Late Spring or Early Summer	Summer or Fall	Withstands drought and moderate shade well. Do not sow until weather is warm and settled.
Crotalaria		Yes	Light Loams	L	●	Long	15	½	¾		●	●		●	Spring or Summer	Summer or Fall	Does well on acid soils. Resistant to root knot nematode. Sow scarified seed.
Fenugreek		Yes	Loams	L		Long	35	1	½					●	Fall	Spring	
Guar		Yes	Widely Adaptable	L	●	Long	40	1½	1					●	Spring or Early Summer	Summer or Fall	Thrives on warm soils. Do not plant too early.
Indigo, Hairy		Yes	Sandy Loams	L	●	Short	10	½	½		●	●		●	Spring or Early Summer	Summer or Fall	
Kale, Scotch		No	Widely Adaptable	H	●	Long	14	¼	½	●	●	●	●	●	Summer or Fall	Spring	Can be eaten after serving as winter cover. In Northern areas interplant with winter rye for protection. Except in deep south, plant in summer for good growth before frost.
Lespedeza	Common	Yes	Loams	L	●	Short	25	1	½		●				Early Spring	Summer or Fall	Easy to establish on hard, badly eroded soils. Good on acid soils of low fertility.
	Korean	Yes	Loams	L	●	Short	25	1	½		●				Early Spring	Summer or Fall	
	Sericea	Yes	Loams	L	●	Medium	25	1	½		●			●	Early Spring	Summer or Fall	
Lupine	Blue	Yes	Sandy Loams	L		Short	100	2½	1			●			Spring Fall	Summer Spring	
	White	Yes	Sandy Loams	L		Short	120	2½	1	●		●			Spring Fall	Summer Spring	Less popular than the yellow lupine and blue lupine. Good on sour and acid soils.
	Yellow	Yes	Sandy Loams	L		Short	80	2	1	●		●			Spring Fall	Summer Spring	
Millet		No	Sandy Loams	L		Long	30	1	½	●					Late Spring or Summer	Summer or Fall	Sow only after ground is warm, a week or ten days after normal corn planting time. Fast growing.
Mustard, White		No	Loams				8	¼	⅛	●					Spring	Summer	
Oats		No	Widely Adaptable	L		Long	100	2½	1	●	●	●	●	●	Spring Fall	Summer or Fall Spring	Winter oats (sown in fall) are suitable only where mild winters prevail.
Pea	Field	Yes	Heavy Loams	M		Short	90	2½	1½	●	●	●	●	●	Early Spring Fall	Summer Spring	Sow in fall only where winters are mild. Distinctly a cool weather crop.
	Rough	Yes	Sandy Loams	L	●	Medium	60	1½	1		●				Fall	Spring	
	Tangier	Yes		M		Medium	80	2½	1	●				●	Spring	Summer	
Rape		No	Loams	L			8	¼	¼	●			●		Spring or Summer	Summer or Fall	
Rescue Grass		No	Widely Adaptable	L		Long	35	1	¾		●			●			Adapted to mild winters and humid climates.
Rye, Spring		No	Widely Adaptable	L		Long	90	2	¾	●	●				Spring	Summer	
Rye, Winter		No	Widely Adaptable	L		Long	90	2	¾	●	●				Fall	Spring	One of the most important winter cover crops. Can be sown late.
Rye-Grass, Italian		No	Widely Adaptable	L		Long	35	1	¾	●	●	●	●	●	Fall Spring	Spring Summer	An important winter cover crop where winters are mild. In severe climates sow in spring or summer.
Sesbania		Yes	Widely Adaptable	L	●	Long	25	1	¾		●	●		●	Spring or Summer	Summer or Fall	Quick grower. Is better adapted to wet soils and will grow at higher altitudes than crotalaria.
Sorghum		No	Light Loams			Long	90	2½	¾	●	●			●	Late Spring or Summer	Summer or Fall	Do not sow until ground is warm and weather is settled. More drought resistant than corn.
Sudan Grass		No	Widely Adaptable	L		Long	35	1	¾	●	●	●	●	●	Late Spring or Summer	Summer or Fall	Rapid grower. Do not sow until ground is warm and weather is settled.
Sunflower		No	Widely Adaptable	L			20	¾	¾	●	●	●	●	●	Spring or Summer	Summer or Fall	Intolerant of acid soils.
Sweet-Clover	Common White	Yes	Heavy Loams	H		Long	15	½	½	●	●		●	●			Quite winter hardy. Best results are from fall sowing.
	Annual (Hubam)	Yes	Loams	H		Long	15	½	½	●			●				A true annual. Best results from spring sowings.
	Yellow	Yes	Loams	H		Long	15	½	½	●	●		●	●			Stands dry conditions better than common white sweet clover.
	Yellow Annual	Yes	Loams	H		Long	15	½	½	●	●	●	●	●			Most useful south of the cotton belt as winter cover. North not winter hardy. Makes short summer growth.
Vetch	Common	Yes	Widely Adaptable	L		Medium	60	1½	¾	●	●	●	●	●	Spring Fall	Fall Spring	Not winter hardy where severe cold is experienced. Needs reasonably fertile soil.
	Hairy	Yes	Widely Adaptable	L	●	Long	60	1½	¾	●	●	●	●	●	Spring Fall	Fall Spring	The most winter hardy vetch. Best sown in fall mixed with winter rye or winter wheat.
	Hungarian	Yes	Heavy Loams	L		Long	60	1½	¾	●	●		●	●	Spring Fall	Fall Spring	Next to hairy vetch the most winter hardy of the vetches. Not winter hardy where winters are severe. Needs fairly fertile soil.
	Purple	Yes	Loams	L		Long	60	1½	¾	●	●	●	●	●	Spring Fall	Fall Spring	Least hardy of the vetches. Suited for winter cover in mild climates only.
	Woolly Pod	Yes	Widely Adaptable	L		Long	60	1½	¾	●	●	●	●	●	Spring Fall	Fall Spring	
Wheat, Winter		No	Loams	L		Long	100	2½	¾	●			●		Fall	Spring	

Three seed catalogs and the risks of hybrid seed

Here are three smaller seed companies which have in common a desire to keep the plant world's gene pool diverse and healthy. This means they either don't carry, or don't stress, hybrid seed.

Hybrid seed is sterile, and results from crossing two different parent plants. The advantage is an increase in yield from genetically uniform plants that have beneficial characteristics from each parent. But this genetic uniformity can make an entire crop vulnerable to an epidemic if a plant disease gets started.

*A recent example of this was the corn leaf blight epidemic of 1970, which that year took 15% of the total US crop (with losses of 50% or more in some Southern states). It occurred because in 1970 practically every corn farmer in America was using hybrid seed from one strain — known as Texas cytoplasm. The fungus that caused the leaf blight had been around for a long time, but had never been a major problem because there was sufficient variety in the hybrid corn strains used to keep it from establishing a good foothold. When the genetic variety disappeared, the fungus happened to evolve a mutant that was ideally suited to Texas cytoplasm, and the epidemic resulted.**

In the context of a starving world, hybrid seed will continue to be developed and used, because the advantages of higher yields are seen to outweigh the risks. But as older varieties are replaced by hybrids they too often are simply lost — no one grows them anymore — and the plant's gene pool gets that much narrower. The companies below are interested in doing something about this.

Redwood City Seed Company
P.O. Box 361
Redwood City, CA 94064
Catalog — $.25 (16pp.) Vegetables, herbs, flowers; some dye plants, trees and shrubs.

Johnny's Selected Seeds
N. Dixmont, ME 04932
Catalog — $.25 (26pp.) Primarily vegetables; the company name was changed recently from Johnny Apple Seeds.

Both of these companies have seed exchange programs. They will swap you some of their seed in exchange for seed you either grow or collect. This way they can increase the varieties they offer and also help insure the survival of rare seed strains and plants by making them available to others. Redwood City Seed Company is interested in dye plants, wildflowers, herbs, and edible plants not available commercially; Johnny's Selected Seeds in vegetable, herb or cereal seed.

A World Seed Service
J. L. Hudson, Seedsman
P. O. Box 1058
Redwood City, CA 94064
(Successor to Harry E. Saier of Dimondale, MI)
Catalog — $.50 (97pp.) Several thousand species and varieties from all over the world. Many are rare. Vegetables and herbs are listed in a separate catalog (15pp.) which you can get by including a 10¢ stamp. The same holds true for a cacti seed list, which is in preparation.

— Richard Nilsen

My Lawnmower Hates Me

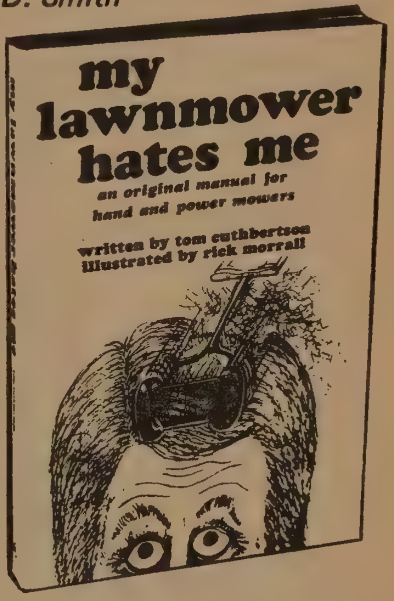
I don't believe in mowing lawns except in public places where gardens wouldn't be more suitable, yet I do have proper credentials as a grass-shortener, having once been incarnated as a Jacobsen operator, mowing greens for the Alliance, Nebraska, municipal golf course. I also have operated a variety of sickle-bar mow tractors in alfalfa and meadow hay, but that has nothing to do with a book about the average home lawn mower. I don't even believe there should be lawns in cemeteries, but I still think this book, **My Lawnmower Hates Me**, *can be valuable to all you folks still into the rolling ball, the backyard barbecue, or the smell of fresh mown hay in the suburbs.*

The new light approach to mechanics is exhibited here, as in **How to Keep Your Volkswagen Alive**, *or in* **Everybody's Bike Book**, *and there is a real possibility that light prose teaches better than technical ritual does, particularly to the grown up who doesn't know shit about the lawnmower he or she has been running once a week since it was new. The illustrations are precise and hand drawn. The attitude toward the machine is cautious, yet full of the knowledge that the lawnmower, like the wine jug, is an artifact with a purpose, and can be understood by most human minds.*

So, if you own one of the counterproductive bastards, and it needs fixing, look into this book. You might learn how to convert it into an overpowered butter churn.

— J. D. Smith

My Lawnmower Hates Me
(An Original Manual for Hand and Power Mowers)
Tom Cuthbertson and
Rick Morrall
1974; 260pp.
$4.25 postpaid
from:
Ten Speed Press
Box 4310
Berkeley, CA 94704
or Whole Earth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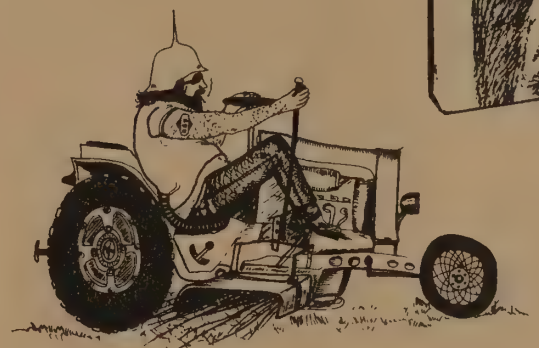

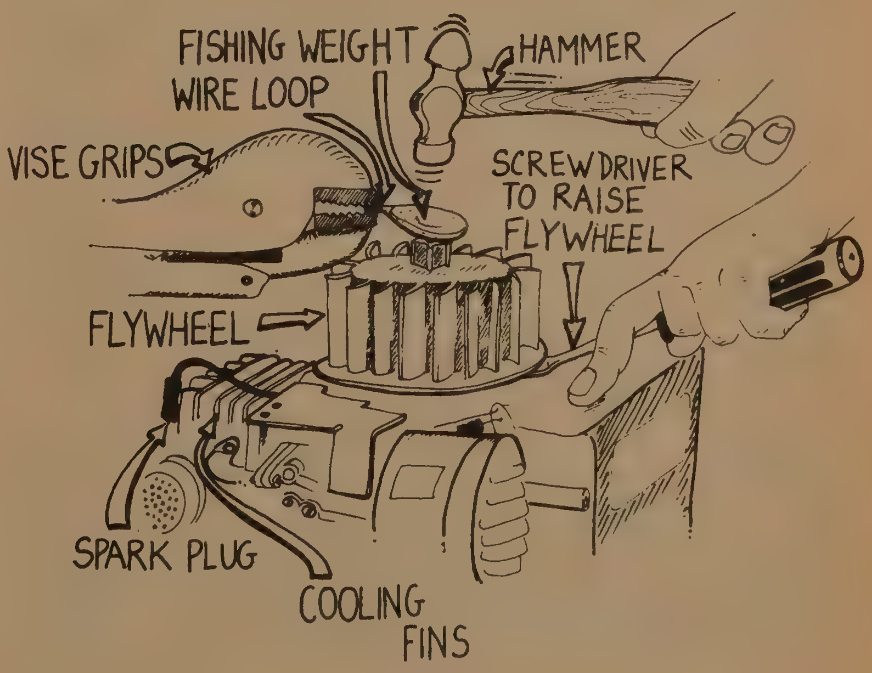

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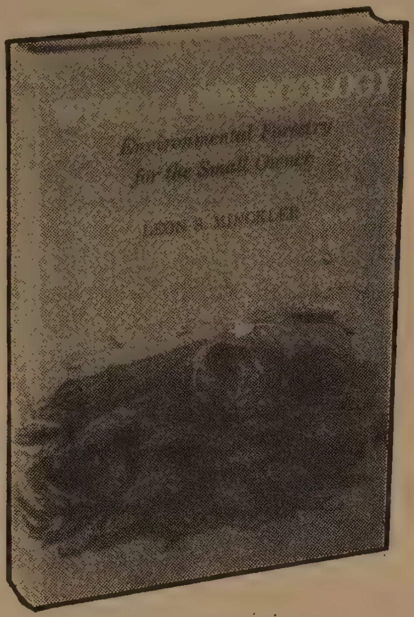
*This whole episode caused a considerable flap in the agbusiness world. If you're interested in learning more, get Genetic Vulnerability of Major Crops (1972; 307pp; ppbk. $7.50) from the Printing and Publishing Office, National Academy of Sciences, 2101 Constitution Ave., N.W., Washington, DC 20418.

Woodland Ecology

73% of the forest land in the eastern United States is held by private, non-industrial owners, according to the author. He contends it is time these small owners realize their significance and begin to take better care of their woodlands. Mr. Minckler considers the eastern hardwood forest types, and in clear, non-technical language, he explains very basic woodland ecology and discusses the options a small owner has in deciding how to maintain and use his woods.

— Richard Nilsen

Woodland Ecology
(Environmental Forestry for
the Small Owner)
Leon S. Minckler
1975; 229pp.
$9.95 postpaid
from:
Syracuse University Press
Box 8, University Station
Syracuse, NY 13210
or Whole Earth



Hardwood forests in the East, if *well managed* and *well stocked*, will make a net growth of 100 to 500 board feet per acre, per year, depending on the site quality. A growth of 250 board feet is probably higher than average. Stumpage values for logs vary widely depending on species, log quality, and local markets, and they change from year to year.

It is risky to use dollar values to show profit or loss from timber operations. Dollars change too rapidly. But look at it this way, fifteen or twenty years ago the value of timber growth per decade on typical forest land was roughly twice the cost of the land (for well-managed woodlands). In the mid-seventies the timber growth value per decade is usually less than half the cost of the forest land. At the same time the fixed costs — including interest, taxes, insurance, and protection — have greatly increased. These are the costs of owning land and of protecting it. They must be paid whether or not you manage the woodland.

A young hardwood stand marked for a combined thinning and improvement cutting that will provide more space for the remaining trees to grow and allow more growth of wildlife food plants on the forest floor.

Commonwealth indeed, Massachusetts

Chapter 654 of the Acts of the Commonwealth of Massachusetts in the year 1974 established a Division of Agricultural Land Use within the Department of Agriculture. Under the provisions of this act, any person may make application to the division of agricultural land use for available vacant public land to use for garden or farm purposes, the priority in allotment going to elderly persons of low income, families of low income and children between the ages of 7 and 16. Products from land uses for gardening may not be sold and products from land used for farming may not be sold on the land where they were grown. Owners of land may make available to the division parcels of land for the purpose of gardening and farming under such terms and conditions as may be agreed upon between the owners and the division.

Although full funding for the division will not be available until at least July, the beginning of the next fiscal year, applications are being readied and the director of the division, Warren P. Shepard, says there may be as much as 6500 acres of vacant public lands to be made available for garden and farm use under this act. Interested parties should contact the new division of agricultural land use in the Saltonstall Building, 100 Cambridge Street, Boston, MA.

This is the first year such a program has been instituted in the Commonwealth and reportedly the first time such a program has been tried in the United States. Due to the problems of novelty and the present lack of funds, the general expectation is that this year will only be a "pilot program". It should be remembered that it is already planting season for some crops (late April) and that many vegetables can grow to harvest in 2 months while the red tape may take 3 to unwind.

Delay is not necessary for the concerned citizen. If you want to plant and know of a parcel of land which might otherwise remain unutilized, you may apply for it under this act, Chapter 654. For as the Commonwealth has said: "Be it resolved that the General Court of the Commonwealth of Massachusetts hereby encourages more local self-sufficiency in food supply and related uses of energy, land, and natural resources". You will not only be helping yourself to fresh vegetables but be acting in accord with the best interests of the Commonwealth and your neighbors.

For further information:

Department of Agriculture
Division of Agricultural Land Use
100 Cambridge Street
Boston, MA 02134

Advance Society Projects, Inc.
30 River Street
Cambridge, MA 02139

— George P. Mokray
Cambridge, Massachusetts

RESOLUTIONS
Encouraging positive approaches and greater self-sufficiency in food, energy, and the economy.

Whereas, The Governor's Emergency Commission on Food has found that New England and Massachusetts are extremely dependent on distant imports of food; and

Whereas, this dependency, coupled with skyrocketing costs of imported energy, is mainly responsible for our consumers paying among the highest retail food prices in the country; and

Whereas, the volumes of active farm land and annual fish harvests in Massachusetts have declined threefold in recent years; and

Whereas, these dangerous situations exist in times of growing national and world uncertainty, thereby threatening the continued abundance of nutritious foods in the Commonwealth; and

Whereas, insomuch as our continued food supply and related needs of production and energy may be endangered, so too are the social, educational, cultural, moral and political uniquenesses and sovereignty of our Commonwealth; therefore be it *resolved* that the General Court of the Commonwealth of Massachusetts hereby encourages more local self-sufficiency in food supply and related uses of energy, land, and natural resources.

To that end, be it resolved by the General Court to be the policy of the Commonwealth to encourage residents of the Commonwealth to supplement their diets more with New England and Massachusetts-produced seafoods, vegetables, fruits, poultry, and dairy products;

To encourage greater uses of composting, recycling of organic wastes, and alternative methods of energy, in order to alleviate dependency on foreign

A quiet chainsaw!

Contrary to public belief, the Stihl 045 is not the best chainsaw going. At least according to those who make a living out of cutting wood in this part of the world (British Columbia). The saw that people are trading their Stihls in for? The Husqvarna 280/380 or 1100. Also Swedish made, Husqvarna is sturdy, dependable and QUIET. They pioneered the quiet chainsaw; it sounds like one of those two cycle motorbikes would, were it properly muffled. The best feature to my mind is the vibration damping. The three main parts of the saw (engine, front handle and rear handle) are joined together by special rubber mountings which wipe out engine and chain vibrations. The engine looks like it's floating on the rest of the framework. After 8 hours of cutting with the Husqvarna, you don't feel like you've been riding a horse with the gait of a jackrabbit. The Husqvarna outclasses the Stihl for chain oiling qualities as well. The smaller Stihls (031, 041, etc.) don't have a manual overide, so when the diaphram pump goes, (as it does) you burn out your blade and bar. The Husqvarnas don't have the overide either . . . . but then they have a cam-activated pump which doesn't give up like the Stihl-type. Mechanics tell me that you can't leave a Stihl sitting around for any length of time (six months or more) without draining the chain oil because it leaks into the crank-case and then you have problems. Not so with the Husqvarna. What hasn't the Husqvarna got going for it? Well, around these parts it is a little more expensive than other comparably powered saws and a might bit heavier.

— Vic Marks

Husqvarna also makes the excellent Viking sewing machine, winning competition motorcycles, and firearms. Their rifles are highly regarded in Arctic climates.

— J. Baldwin

Husqvarna 280
$350.00 approx.
with 22" blade
from:

Bee Tee Engine & Equip. Sales
2424 Teagarden Street
San Leandro, CA 94577
(415) 483-4470

R.L. Gould & Co.
3711 Lexington Ave. North
St. Paul, MN 55112
(612) 484-8411

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energy sources and enhance the long-term quality of soils;

To support an extension of the Atlantic fishing jurisdiction to 200 miles;

To encourage the private and/or public development of local food receiving, processing, storage, and milling facilities;

To encourage tax, credit and insurance incentives benefiting employment in and the survival of the Massachusetts farming, fishing, and urban retail-food industries;

To support national policies that encourage the re-orientation of the depressed auto industry towards the production of agricultural machinery;

To encourage a co-ordinated approach among the regional states relating to agricultural, maritime, fishing, and energy concerns;

And to encourage public and private agencies and citizens to co-operate in meeting the ends of this resolution, remembering that the success of our endeavors in the Commonwealth may inspire other communities to act similarly.

Be it further resolved to be the policy of the Commonwealth:

To encourage citizens to plant community gardens and to form pools of machinery and tools for gardening;

To encourage citizens to plant winter gardens and to commence in the preserving, freezing, and storage of locally-grown foodstuffs to alleviate the especially high food costs and foreign dependency entailed thru winter;

To encourage greater consciousness among citizens regarding healthful nutrition and wise consumership;

To encourage public utilization of already existing informational services to pursue these ends;

To encourage greater sensitivity among citizens and agencies both locally and nationally to the needs and aspirations of less fortunate people everywhere;

To encourage citizens to maintain courage in the coming years while nurturing activities that will mutually enhance our quality of life;

To encourage citizens of all occupations throughout the Commonwealth to familiarize themselves with various earth-skills in a healthy spirit of thankfulness to the earth.

AN ACT establishing a division of agricultural land use within the Department of Agriculture.

Whereas, The deferred operation of this act would tend to defeat its purpose, which is to establish forthwith a division of agricultural land use within the department of agriculture, therefore it is hereby declared to be an emergency law, necessary for the immediate preservation of the public convenience.

Be it enacted by the Senate and House of Representatives in General Court assembled, and by the authority of the same, as follows:

Section 14. Any person may make application to the division on a form to be furnished by the director for a permit to use available vacant public land for garden or farm purposes. Applicants shall submit a plan for said use and shall agree to maintain the land in a condition consistent with said land use plan, and shall agree to abide by the rules and regulations promulgated by the division. Failure to carry out the conditions of agreement shall result in the forfeiture of the garden or farm permit. Any person who is granted the use of garden or farm land shall indemnify and save harmless the commonwealth, the department of agriculture and all of its officers, agents and employees against suits and claims of liability of each name and nature arising out of, or in consequence of the use of vacant public land.

Section 15. Priority in the allotment of vacant public land for garden purposes shall be given to elderly persons of low income, families of low income and children between the ages of seven and sixteen, inclusive. Products grown in gardens shall not be sold.

Section 16. The director shall, with the cooperation of other state agencies and cities and towns, compile a list of all vacant land, that in the opinion of the said agencies and cities and towns, can be feasibly used for gardening or farming. The director shall, by letters of agreement, contract with such agencies or cities and towns for the use of said vacant land. Contracts may contain a termination date. If no date is determined, either party may terminate the contract by written notice given within sixty days; provided, however, that no contract may be terminated until the end of the harvest season. The division shall notify the gardeners or farmers of said notice of termination.

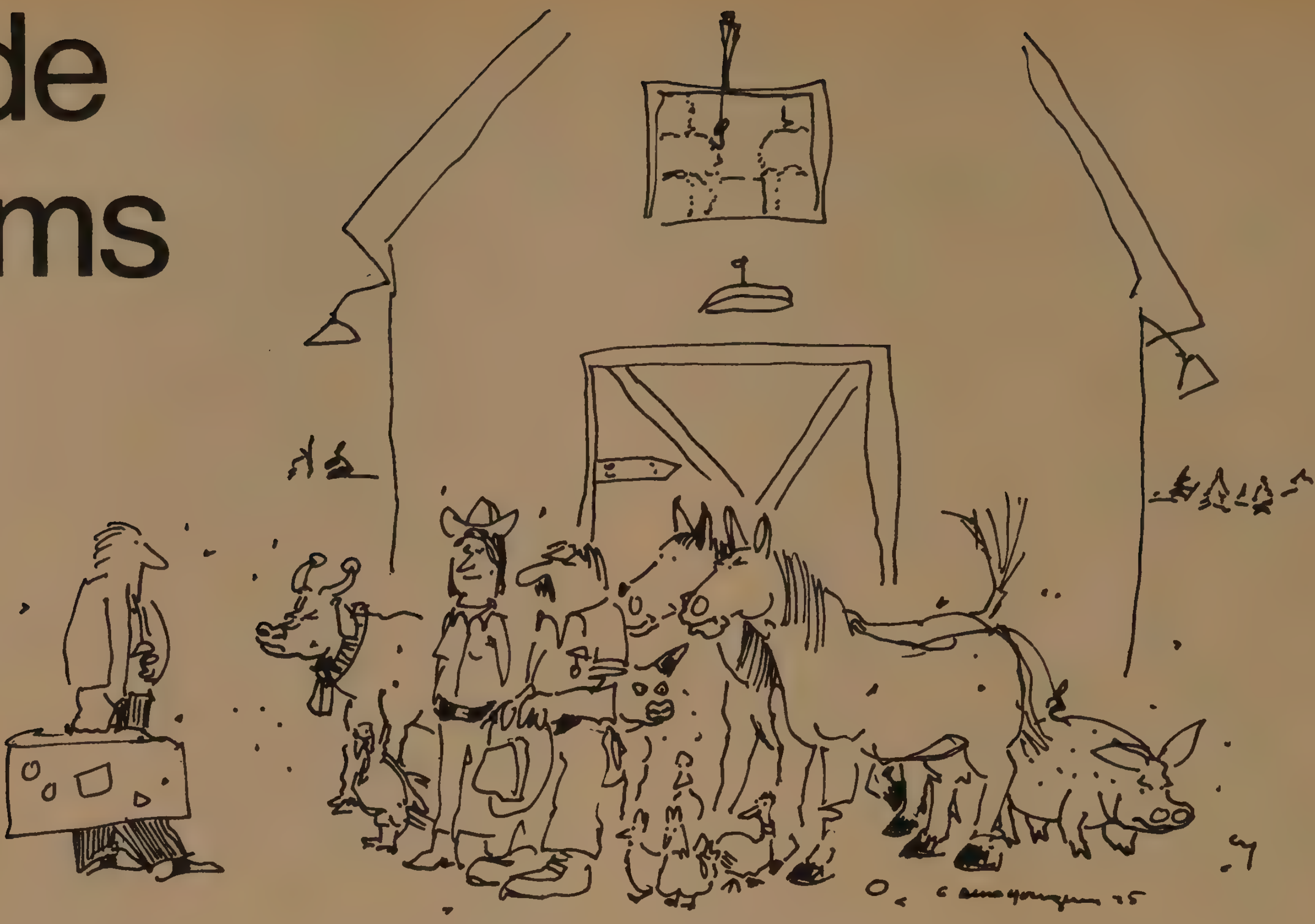
Section 17. Owners of land may make available to the division parcels of land for the purposes set forth in section fourteen under such terms and conditions as may be agreed upon between the owners and the division, and the commonwealth, the department and all of its officers, agents and employees shall be saved harmless as provided in said section fourteen.

Section 18. The commissioner after a public hearing shall adopt and promulgate rules and regulations in accordance with the provisions of chapter thirty A and consistent with sections thirteen to seventeen, inclusive.

Section 19. Any person aggrieved by a decision of the commissioner may, within ten days after such decision, appeal therefrom, by petition to the superior court in the county he resides in, or the county of Suffolk. The court shall hear such petitions speedily in accordance with the usual course of procedure in equity, and may affirm, modify or revoke such decision.

House of Representatives, July 22, 1974.

Dude Farms



...AND ON BEHALF OF THE STAFF, WE WELCOME YOU...

BY SALLY NICHOLSON

Illustrations by Russ Youngreen

It occurred to me at lunch one day last month that there might be a way to put some city money back into the countryside, stave off the disappearance of small farms by making them financially secure, and educate people in life processes and survival, all at the same time. There are dude ranches and guest farms. But how about dude farms?

A working dude farm could be any size. The number of "guests" would be determined by how many would make it a good labor-intensive situation, and by how many you could sleep in the barn, or wherever. In return for a stiff tuition guests would be fed (doing the cooking themselves), housed, and given a crash course in fixing and maintaining the tractor, truck, fences, irrigation system, generator, water tank and outbuildings; hauling and spreading manure, disking, tilling, planting, irrigating, hoeing, picking and harvesting; tending livestock; cooking, eating or preserving what they grow; chopping, hauling and splitting wood. They would also be paying to find out how they manage with several months of getting wet, cold, hot, exhausted, sore, bruised, smelly, bored and homesick. A sort of Club Mediterranée for the Calvinist set.

Here's some of what could come from it. I pictured the dudes as coming mostly from cities and suburbs. People who want to go "back to the land." Those who make it through the season would gain a generalist's-eye-view of what it actually takes to farm a place. For some it would be a cheap way of finding out they don't really want that little farm after all.* Others who still did would have a clearer idea of what is involved. And the farm-owners themselves would be provided with a willing and eager adult labor force to maintain the place, bring in the crops for storage and marketing, chop and split enough wood for the whole winter, and perhaps cover the taxes as well. ■

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* "Of course at the time of the last March sowings those of November were knee high, but as the dry season followed close, all seemed to mature nearly together, and were in fact harvested together, but long before the last, and even before sowing was finished, my agricultural enthusiasm had begun to evaporate . . . . Beyond the requisite amount of pot-hunting, I failed to acquire or could not maintain an interest in that sort of shotgun trifling, and in short the change of life, however praiseworthy and respectable, had been too sudden to last, and a deep gloom of ennui and disgust settled down on me, from which I felt that I must run away or die.

". . . I hated and despised myself when I reflected that I had voluntarily abandoned all these joys, to grub after wheat and barley and potatoes, and was to be rewarded by an endless succession of future mornings with tiresome views of the same dull fields, and no more exciting adventure than shoeing a horse or mending a strap . . ."

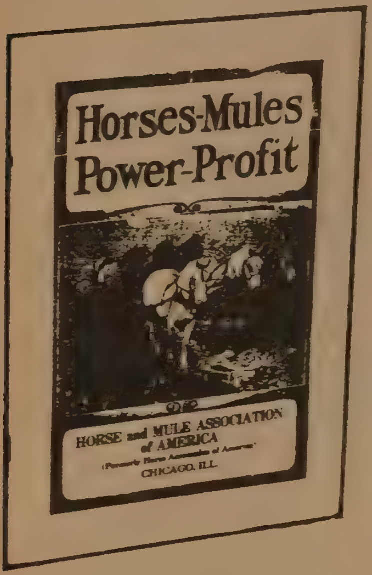
— Autobiography of General Isaac J. Wistar

THE UNDERHAND THROW IS BEST...
CHICKEN HOUSE

Detweiler's Harness Shop

Lotta harness has gone bad from lack of use over the past thirty years. These folks are still building new harness the old way. Looks to be a complete line of draft horse paraphenalia right down to the tools you need for harness repair. Although the catalog costs five bucks, you get it back in credit on your first order. If you are thinking about using ol' Nelly to help you with your sodbusting, you might just get your five bucks worth in information alone. Of special interest to me in this catalog was a $1.95 reprint of a thirties book called Horses-Mules, Power-Profit, *which sets out multiple hitch patterns for the maximization of real live horsepower.*

— J. D. Smith



Catalog
$5.00 postpaid

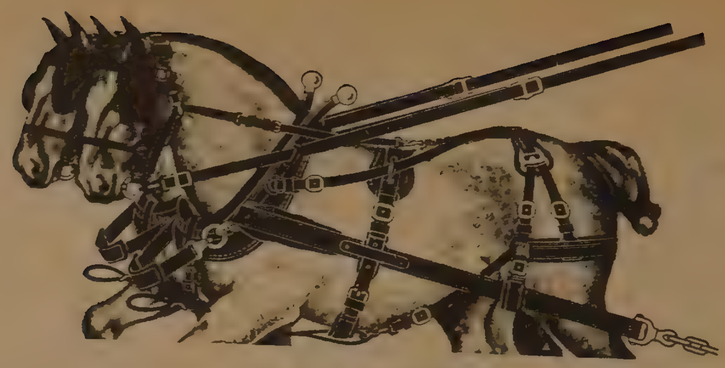
Horses-Mules, Power-Profit
$1.95 postpaid

from:
Detweiler's Harness Shop
R.R. #1
Box 228
Hazelton, IA 50641

Men whose costs are low have good pastures where horses and mules are turned when not at work; they feed oat straw or sheaf oats and corn fodder for part of roughage; allow each animal when not on pasture 5 pounds of leguminous hay three times per week for its action on kidneys and bowels; cut down on grain on non-work days; and carry idle horses through winter without grain. They also make it a rule to work young animals (3 to 6 years old, which are increasing in value while at work) of good type, size, and quality, which deliver maximum labor for feed consumed.

Horse and mule costs are largely non-cash; feed is produced on the farm and, when wisely utilized, is largely roughage that would not have brought enough on the market to pay for baling and transportation. Labor usually is the farmer's; thus, while he may be said to pay out money for caring for horses or mules, he pays it to himself; hence it is a non-cash cost. Shelter, equipment, interest on investment, shoeing, and miscellaneous items do represent cash outlay, but these rarely exceed 30% of the feed cost in areas where horses and mules are raised.

— Horses-Mules, Power-Profit



No. 321 — Farm Harness

Smooth Finish, Cadmium or Black Trimmed, Without Hames or Collars

No. 321 Harness with 1 1/2 inch traces, breast straps and martingales, No tie straps .... per set $350.00

No. 328 Harness with 1 3/4 inch traces, 1 3/4 inch breast straps and martingales, No tie straps .... per set $375.00

No. 328 Bridles, per pair $50.00 All Harnesses ARE PRICED PER SET, OR FOR 2 HORSES.

A study of the bucking-back system will show that if the rear horses should try to start before the leaders do the draw chain would be pulled back and the rear horses would be forced to pull the load with their mouths. The rear horses, however, cannot get over the lead eveners if the buck ropes are properly adjusted, and if the load is heavy enough they cannot move it with their mouths. In case the rear horses try to run away, all the driver has to do is to keep the lead team in check, and the rear team will be automatically checked by having to draw the load with their mouths. If no load exists, they can run away.

When tie chains and buck ropes are properly adjusted, moreover, the horse has several inches of play backward and forward; that is, he is not strung in tight while working. It is remarkable how quickly some teams learn to start and stop together, not even taking the slack out of the lead chains and buck ropes.

— Horses-Mules, Power-Profit

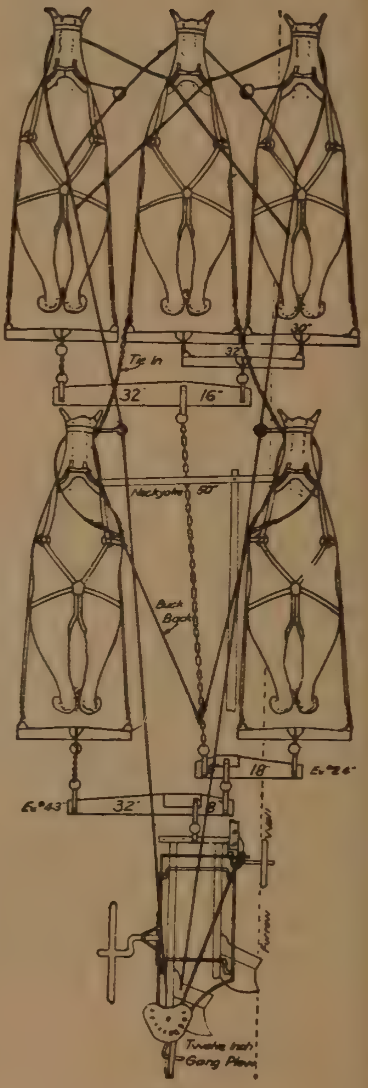
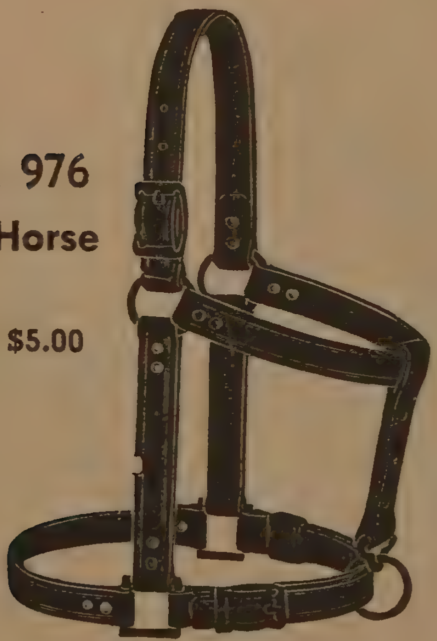


Fig. 8

No. 976
Draft Horse

Each $5.00



Our Main Collar for Field Work

This is a good quality collar. Has 18" draft, with thong sewed inseam and ribbon lace outseam. Full face from 18" to 22" collar.

No. 16	11 lbs.	Each **$32.00**
12 lbs.	23 inch	Each **$33.75**
12 lbs.	24 inch	Each **$36.50**
13 lbs.	25 inch	Each **$39.50**
14 lbs.	26 inch	Each **$42.75**
15 lbs.	27 inch	Each **$48.25**
16 lbs.	28 inch	Each **$54.50**
17 lbs.	29 inch	Each **$61.50**
19 lbs.	30 inch	Each **$69.75**

The Mule

This book was written in 1867 by the Superintendent of the Government Corral in Washington, back in the days when the tools of war could be hauled around by thousand pound animals. It is a nice little personal tractatus on the rearing, breeding, training, breaking, uses, character, abuses, and ailments of the mule. Liberal consciousness has advanced over the past hundred years in inverse proportion to the use of the mule. Now that we have established that us white folks committed genocide against American Natives with the help of the mule, maybe we can get back to the use of beasts of burden with better societal results. Mule books are hard to find. This is a good one.

— J. D. Smith

The Mule
(A Treatise on the Breeding, Training, and Uses, To Which He May Be Put)
Harvey Riley
1867; 107pp. (reprinted)
$3.75 postpaid
from:
Hee Haw Book Service
Paul and Betsy Hutchins
Rt. 5, Box 65
Denton, TX 76201

There is another fault the mule has to contend against. It is the common belief among teamsters and others that he has less confidence in man than the horse has, and to improve this they almost invariably apply the whip. The reason for this want of confidence is readily found in the fact that mule colts are never handled with that degree of kindness and care that horse colts are. They are naturally more stubborn than the horse, and most of those persons who undertake to halter or harness them for the first time are even more stubborn in their disposition than the mule. They commence to break the animal by beating him in the most unmerciful manner, and that at once so excites the mule's stubbornness, that many of them, in this condition, would not move an inch if you were to cut them to pieces. And let me say here that nothing should be so much avoided in breaking this animal as the whip. The young, unbroken mule cannot be made to understand what you are whipping him for.

Carroll Saddle Company

These folks are exponents of the hackamore, snaffle, spade progression in the training of a saddle horse. Their saddles and gear are designed by some of the top trainers in America, Ed Connell, Lee Wood, and Dave Jones among others. Their saddle designs reflect their interests in horses that rein easily, like cow ponies and cutting horses. The weight of the rider is distributed more over the withers, more foreward than in the conventional Sears saddle. A basic, plain, untooled Carroll saddle costs $350, which isn't a bad price for the quality you get, and the amount of use a good saddle can take. The catalog is not nearly so nicely crafted as their saddles, which is a good sign to me that they aren't pouring a load of time and money into advertizing. Jack Carroll could make a living by word of mouth.

— J.D. Smith
[suggested by Marcia Anderson]

Catalogue
$1.00
from:
Carroll Saddle Co.
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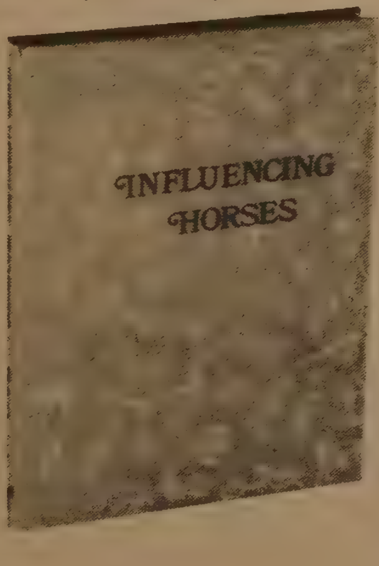
Influencing Horses

If you know an eleven year old city kid who is getting into horse consciousness, drawing horse pictures, but doesn't know much about how to act with a horse, get ahold of this book as a birthday present or something. This is an elementary but thorough work on the psychology of the horse, what to expect from a horse, and what a horse expects from a rider. Simply written, zenly illustrated. Good companion on horseless evenings. Questions at the chapter ends.

— J. D. Smith [Suggested by Rasberry]

Influencing Horses
Emma McCrary
1973; 181pp.
$8.95 postpaid
from:
Caballus Publishers
Box 2307
Fort Collins, CO 80521
or Whole Earth



Hopefully you won't climb on a horse that wants to go faster than you do. But if you do find yourself in that predicament, don't simply pull on the reins. If the pressure is constant he will keep right on going and not listen to you. When a horse takes off or tries to go too fast, remember that if you relax you're more in control of the results and aren't multiplying the scared feelings of the horse. Pull the reins hard and release the pressure quickly, then pull hard again. You can't hurt the horse if you release immediately between pulls. If you get tense it makes him tense too and tightening your thigh muscles just pushes you out of the saddle. Sit down hard without leaning forward. Feel that you CAN control the situation. Pull hard, release a little, pull hard again, release again. The horse doesn't like that pressure, that hurt, that insistence he can't get away from. He knows that he is supposed to stop and has to make a choice. You are seriously asking him to come to a full stop. If he's still out of control and still running, jerk many times strongly. If that doesn't work use one rein only, turning his head to throw him off balance and he'll have to slow down. Throwing him off balance enough to make him fall takes a very exact movement with exact timing so there is little chance of your doing this. As a last measure to stop him reach way down almost to his bit and pull his head around, forcing him into a curve. He won't be able to run very fast if he's going in a tight circle. Whatever you choose to do the most important part is believe you can do it enough to do it.

SEED CLOUDS, REAP HAVOC

BY PATRICK J. PORGENS
AND JAMES R. BUKEY

Of all the tampering with the environment that the ecology movement has alerted us to, cloud seeding and other weather modification schemes have drawn the least attention. There are occasional newspaper stories about the increasing dampness of northern hemisphere winters, but these usually focus on geologists' speculation that a new ice age may be on the way. Almost lost in this "debate" about the maybe-impending ice age is the certainty that man-induced precipitation has had a profound effect on the water cycle in California and elsewhere in the U.S.

Weather modification is one of mankind's oldest and most basic concerns. (Rain dances, chants and other weather-connected rituals provided the ceremonial core of most primitive religions.) But the feasibility of actually influencing the weather wasn't demonstrated until the end of World War Two. On November 16, 1946, two General Electric scientists, Vincent Schaefer and Irving Langmuir, dropped pellets of dry ice from an airplane into a cloud bank over western Massachusetts. The seeding transformed the clouds of water droplets into ice-crystal clouds, and minutes later the crystals fell in the form of snow.

High hopes were raised in a country that had the Dust Bowl drought in mind. Agriculture, hydro-power plants and fisheries all depend on water falling at the right time and place. The new weather-modification techniques also seemed well suited to the field of aviation: if you can make it rain you could probably break up major storms and disperse fog banks. The possibilities seemed endless, and in that postwar euphoria no one foresaw the dangers of widespread, unregulated cloud-seeding. In the '50s and right up to the present, as we shall see, private firms and various government agencies were encouraged to get into the weather-modification business and to experiment freely, with no restrictive laws limiting their activities.

Any idiot with $50 can seed clouds without anybody's say-so and without having to answer if his act leads to pollution, flood or drought.

Likewise the Government's enthusiastic commitment to weather modification is leading rapidly to what Steve Baer predicted to Jim Bukey a while back: we will be obliged to BUY our weather from the Government. And everyone will be pissed off all the time about the weather they're getting.

Patrick Porgens is an eco-analyst who writes environmental impact reports and lobbies for environmental issues in California. He is working on a book about weather modification.

Jim Bukey is one of the editors of the **Energy Primer,** *the current definitive word on energy alternatives, $4.50 from Whole Earth Truck Store, 558 Santa Cruz, Menlo Park, CA 94025.*

This article was edited and condensed by Fred Gardner.

—SB

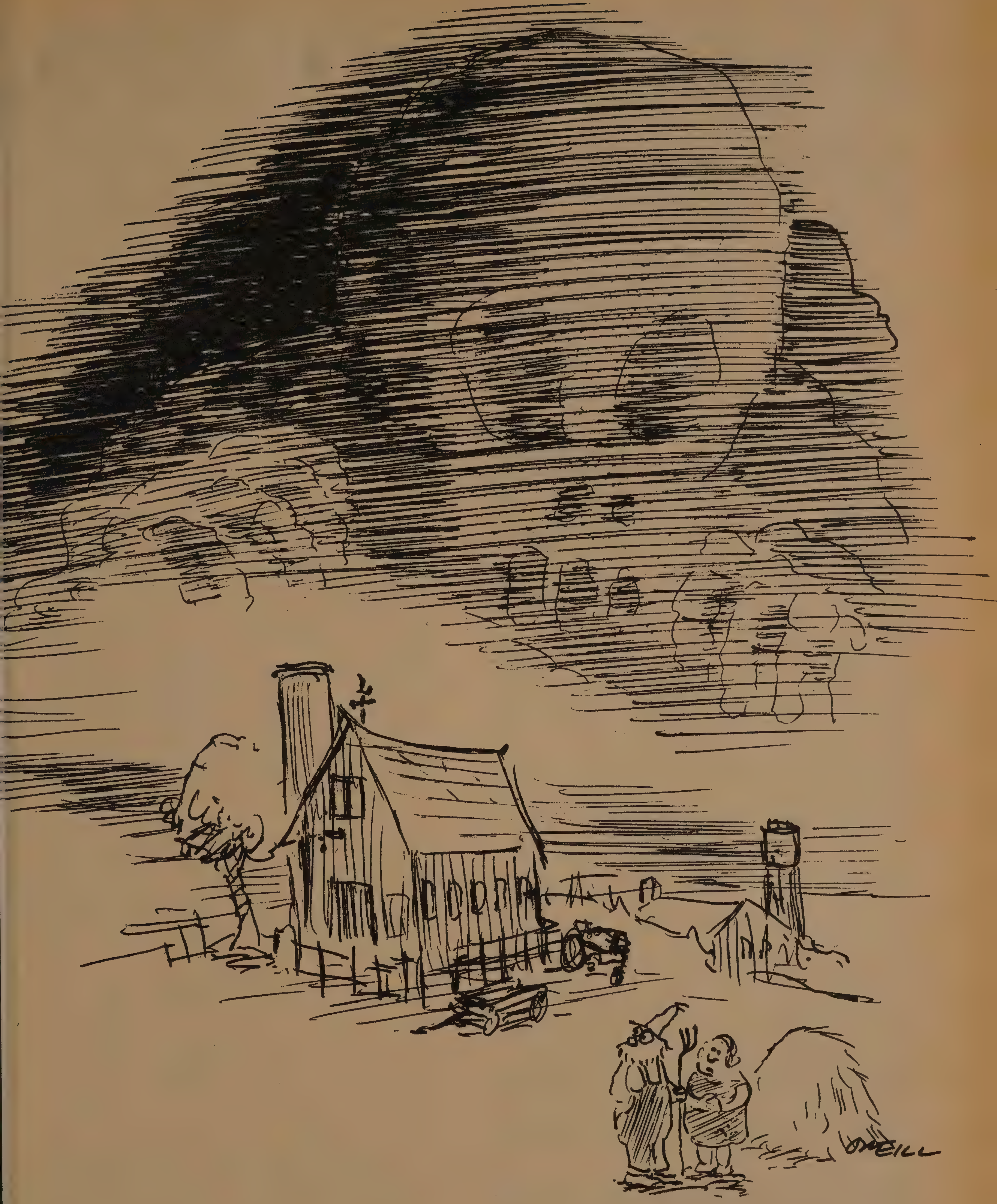
We feel that this laissez-faire approach is increasingly irresponsible, and that it is time to review the scope and impact of weather-modification projects.

Cloud seeding is technically quite simple. Clouds are made up of billions of tiny ice crystals and/or water droplets which form around microscopic particles in the air — soil, dust, smoke, salt crystals and so on. The process whereby the formation of raindrops is initiated or accelerated by human intervention is known as artificial nucleation. In the early '50s Bernard Vonnegut,* also a G.E. scientist, showed that silver iodide was the most effective nucleating agent for seeding super-cooled clouds. Since then a number of other materials have been used in various circumstances: 1.5-dihydroxynapthalene, metaldehyde, chlorosulfonic acid, carbon black, common salt, water spray and Portland Cement (quicklime). The original agent, dry ice, has been found to be most efficient for seeding warm clouds and fogs. Salts, although cheap and easy to use and handle, are not favored because they are highly corrosive and have heavy adverse impacts on the environment. The long-range impact of silver-iodide, a heavy metal, is relatively unknown.

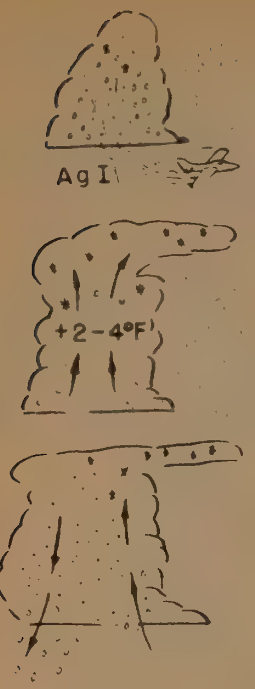
There are basically two methods of dispersing these substances into the clouds: aerial and ground-seeding generators. Aerial seeding is done with generators or flares mounted on the wings of an aircraft. Ground-seeding generators are usually remote-controlled by radio and have been designed to regulate the amount of silver iodide released into the air (from 20 to 140 grams per hour) depending on whether the clouds overhead look promising. Ground seeding is generally used when and where large, uniform cloud formations exist and precise delivery of the nucleating agent is not essential. Such is the case over the Sierra Nevada during the winter months when slow-moving orographic clouds (whose shape and size are determined by the disturbing effects of mountains upon the passing flow of air) prevail. In the summer, when smaller cumulus clouds form, aerial seeding is the method of choice.

Weather modification in California was first sanctioned by the state legislature in 1951, when $50,000 was appropriated to the Division (now Department) of Water Resources to study rainmaking possibilities in the Carrizo Plains, along Santa Barbara County's Pacific coastline, and in the south Sierra Nevada. At this time a law was passed establishing "control" over weather-modification activities. Basically all that is required to obtain a license for cloud seeding or any other weather-modification effort (fog dispersal, lightning suppression, hail suppression) is that one file a notice of intention and pay a fee of $50 per year. According to the law,

***This is Kurt Vonnegut's brother.**
—Dan O'Neill



HENRY... I FORGOT TO PAY THIS MONTH'S WEATHER BILL..



1. A concentrated charge of silver iodide (AgI) is delivered directly to cloud where it converts supercooled drops into ice.
2. This rapid freezing releases heat which increases the cloud chimney temperature by (2-4°F) thus producing a strong pulse of energy which causes substantial cloud growth.
3. This cloud growth in turn processes more water and develops more efficient precipitation.
4. The amount of growth is dependant upon the amount of AgI released into the cloud and the efficiency of AgI particles as well as the structure of the natural environment.

which still stands, no one can be refused a license to modify the weather! From 1951 through 1972 there were 183 separate precipitation management programs, eight lightning suppression projects, 20 hail modification projects and eight fog dispersal projects reported by licensees. Although these "programs" sound very rigorous and scientific on the license applications, many have been conducted in the most free-lance manner imaginable. An orchard owner in the Central Valley who sees some promising clouds drifting overhead can call Atmospherics, Inc. in Fresno (one of the licensees) and order a cloud seeding operation. In legal jargon, cloud-seeding is a "non-discretionary" activity: there is no requirement that the indirect effects of the operation be measured or reported in any way.

But who is to say that the effects of cloud-seeding are really negligible? If you make rain in one place, you suck water away from another area, creating the possibility of drought and fire. What happens if the hydrologic cycle is sped up? What about weather outside the "target area"? What happens 200 or 2,000 miles downwind? Nobody knows the answer for sure. What are the effects upon the natural cycles of erosion, plant productivity and animal migration? Today in the Central Valley the bee population — vital to agriculture — is threatened by a dearth of pollen. This is a direct result of the recent damp winters.

No one is sure of the inadvertent impact of weather modification on the bacteriological communities. Does it retard or increase growth patterns? Reports indicate an increase in root fungus in the oak species and digger pine in areas where precipitation has been increased. A causal effect hasn't been proved or disproved.

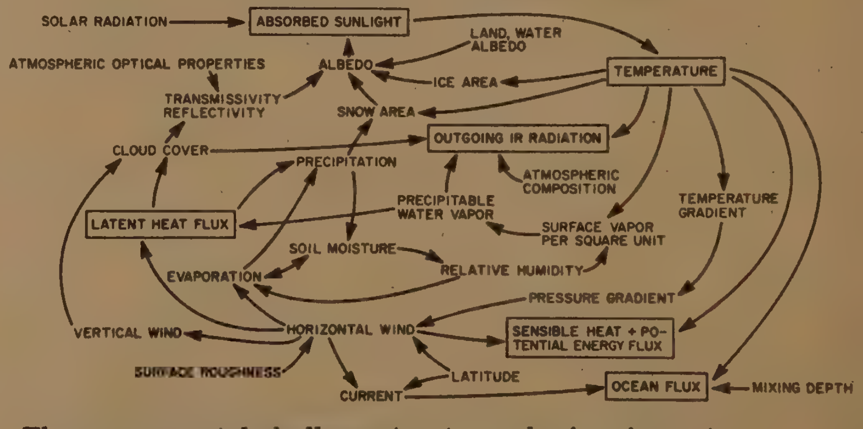
Another question which will have the most far-reaching effect into the entire scientific community, is the problem of totally hypothetical statistics. The data being compiled today on increment precipitation (rain and snow measurement) is and has been distorted and no one in the entire group of weather modifiers knows to what degree, because of the total unregulation of their activities. The data does not take into consideration any factors or percentages based on the increased precipitation caused by weather modification. The distortion from these unregulated activities could possibly invalidate all "field study" data from the last twenty years.

Flooding is another possible result of cloud-seeding activities. There was a disastrous flood in the Yuba City-Marysville area of California on December 24, 1955. At this time North American Weather Consultants, under contract to the Pacific Gas and Electric Company to increase precipitation in the Feather River drainage area, was actively conducting cloud-seeding operations. In the flood that occurred at the confluence of the Feather and Yuba Rivers HOW MANY lives were lost, and property damage ran into the millions of dollars? A suit against PG&E and North American Weather Consultants to recover the damages failed when the plaintiffs were unable to "prove" that cloud-seeding was specifically responsible.

In early June of 1972 an even more devastating flood ripped through Rapid City, South Dakota, taking the lives of 230 people and causing an estimated $155 million in damage. On the day of the flood, June 9, there were a number of weather modification activities going on in South Dakota, and one project based in Rapid City itself: Project Cloud Catcher, sponsored by the U.S. Bureau of Reclamation and conducted by the Institute of Atmospheric Sciences through the South Dakota School of Mines and Technology. The main objective of this program was to augment rainfall during the summer months and to reduce the amount of hail or to direct it elsewhere. On June 7 a large storm front was observed moving into the interior regions of the U.S. and the National Weather Service issued flood warnings for the western states. Even though the clouds would probably have produced a great deal of rain, the modification managers decided to send two seeding airplanes into the clouds. Torrential rains followed — 15 inches within three hours in some areas — creating havoc and destruction.

A disaster of this magnitude could not go uninvestigated. Immediately after the flood the director of the Institute of Atmospheric Sciences, Dr. Richard Schleusener, issued a report to South Dakota Governor Richard Kneip. In it he declared, "I can assure you that the cloud seeding did not contribute to this disaster." The governor called together a Board of Inquiry consisting of three members. The chairman was Pierre St. Amand who had worked at the China Lake Naval Weapons Base in California, researching the military uses of weather modification. He is not a meteorologist. The second member was Robert D. Elliott, President of North American Weather Consultants in Santa Barbara. It was North American, with Elliott as President, that had been involved in seeding the Feather River at the time of the Yuba City flood in 1955. The third member was Ray Jay Davis, attorney for PG&E in the suit against that company and North American stemming from the Yuba floods. The Board concluded: no relation between cloud seeding and flooding.

According to Davis, "Persons attempting to recover damages from weather modifiers have been very unsuccessful. Problems in judicial procedure, at least in part, account for this. Lay jurors may not be qualified to cope with technical issues concerning the kind of care weather modifiers should take to avoid harm to others and issues dealing with connecting the harm the plaintiff asserts has befallen him and the conduct of the defendant."



The monumental challenge to atmospheric science to build a mathematical model that includes all important factors affecting the earth's climate is illustrated by this schematic figure of climatic feedback linkages. The chief difficulty is that many of these feedback processes have influences which are comparable in magnitude but opposite in direction; *IR*, infrared.

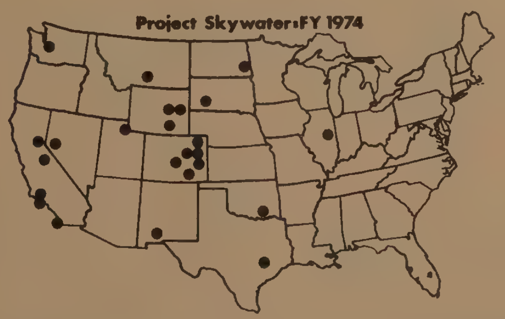
— From Science, 27 Dec 74

Not only have the private firms involved in weather modification programs avoided financial responsibility for damage they may have caused; they have actually received government assistance to promote their "experiments." In California, for example, the Pacific Gas and Electric Company is a primary beneficiary of the U.S. Department of the Interior's "Project Skywater." The basic goal of Skywater is to increase rain and snow fall in water-short areas of the nation, particularly to help in the processing of energy resources. Since 1961, when Congress authorized Skywater, some 120 "experiments" have been conducted at a cost to taxpayers of hundreds of millions of dollars. Studies conducted in the Sierras show an increase of from 5% to 15% as a result of seeding winter storms. Increases of close to 100% were achieved from seeding summer cumulus clouds. The additional runoff means more water for PG&E's hydroelectric and nuclear power plants downstream — higher pressure for the turbines and higher profits for the owners. It also means less precipitation for the lee side of the mountains in Nevada.

PG&E's two large-scale cloud-seeding programs are being conducted in the Mt. Reba area (in the Mokelumne River watershed of the Central Sierras) and the Mt. Lassen area (near Lake Almanor and the headwaters of the North Fork of the Feather River). Most of the seeding is done between November and May. Generators are remote-controlled from PG&E's Caribou hydroelectric plant on the North Fork of the Feather. The nucleating agent is silver iodide and sodium iodide mixed in an acetone base. The power company's stated purpose is not only to increase precipitation but to "determine the effectiveness of cloud-seeding." (They prefer to do their moneymaking in the name of scientific research.) Figures compiled through Project Skywater indicate that incremental precipitation from cloud-seeding in the Feather River watershed has been as high as 5.88 inches annually.

The area affected by PG&E's cloud-seeding extends into the Mt. Lassen National Park and the Plumus National Forest. SEPA (Safeguard Environmental Protection Agency), a California-based citizens' group with which the authors are associated, has been trying to determine the legal implication of weather modification programs that affect federally owned land — especially wild river and wildlife areas. We are awaiting a ruling from the U.S. Division of Forestry.

Another user of weather modification for socially dubious purposes is the Pentagon. In May, 1972, the Defense Department acknowledged that it had been engaging in cloud-seeding operations in Indochina since 1967. Prior to this announcement, several Secretaries of Defense had consistently denied that the Department had been involved in such operations. The military spent $21.6 million to induce rain over the trails and roads of Laos, Vietnam and Cambodia. Some 2,602 weather-modification missions were flown, with seeding generators mounted on the wings of reconnaissance planes. Military spokesmen claimed that the missions resulted in up to seven inches of additional rain over certain areas of Vietnam — causing landslides and floods, making the unpaved roads impassable, and establishing cloud-seeding as "a valuable tactical weapon."



PROJECT SKYWATER CONTRACTORS

Aerometric Research, Inc.
Atomic Energy Commission
California State University
Colorado State University
EG&G, Inc.
Montana State University
NOAA
North American Weather
North Dakota State University
Soil Conservation Service
South Dakota School of Mines
South Dakota Weather Control Commission
State of Washington
Texas Water Development Board
University of Colorado
University of Illinois
University of Oklahoma
University of Nevada
University of Wyoming
Utah State University
Weather Science, Inc.
Western Scientific Services, Inc.

In the latter part of 1974 a government publication entitled "Need for a National Weather Modification Research Program" pointed out that there is still no central authority directing cloud-seeding and related operations in the U.S. Nor is there a uniform body of law or set of standards governing work in the field. Federal legislation covering commercial weather modification is non-existent. (A jurisdictional role for the Federal government seems crucial because cloud seeding can bring about interstate redistribution of water.) State legislatures are moving toward greater regulation and control, but there are still several states that haven't dealt with the problem at all.

The questions raised by cloud-seeding operations will undoubtedly become more serious in the months and years to come. In the past 50 years, per capita use of water in the U.S. has increased 25-fold and our water demands are expected to double by 1980. A shortage of famine proportions is a strong possibility. The desalination of ocean water, much discussed as an ideal solution to the problem, is technically and economically far-fetched at this time. We expect that the pressures on government and industry to engage in more widespread cloud-seeding, regardless of the environmental impact, will become extreme.

We feel that a national water policy is called for, based on principles of conservation and placing the common good above private profit. As a modest beginning, we content that weather modification programs undertaken in California should comply with the state's Environmental Quality Act, and that any party engaged in cloud seeding should be required to file a rigorous Environmental Impact Report. This is now the position of the state Attorney General.

Faced with an obligation of filing an Environmental Impact Report, four of the 11 outfits that had applied for weather-modification licenses in the 1974-75 winter season decided not to engage in cloud seeding after all — an indication that the ecological effects are not as negligible as industry spokesmen have contended all along.

There remains a question as to how accurate and thoroughly documented the reports that do get filed by weather-modification firms will be. Since these are public documents, subject to scrutiny and challenge, we consider it important that ecology minded people prepare themselves to analyze the reports. To this end we have prepared a Fact Sheet on Weather Modification, available from SEPA, P.O. Box D31, Chico, CA 95926.

Only an informed and committed group of citizens can force the "experts" who have a vested interest in extending weather-modification operations to document the effects of their work. It will not be an easy fight. But by undertaking it we may be able to restore the sacred — or at least the ecologically sound — purpose of rainmaking. ■

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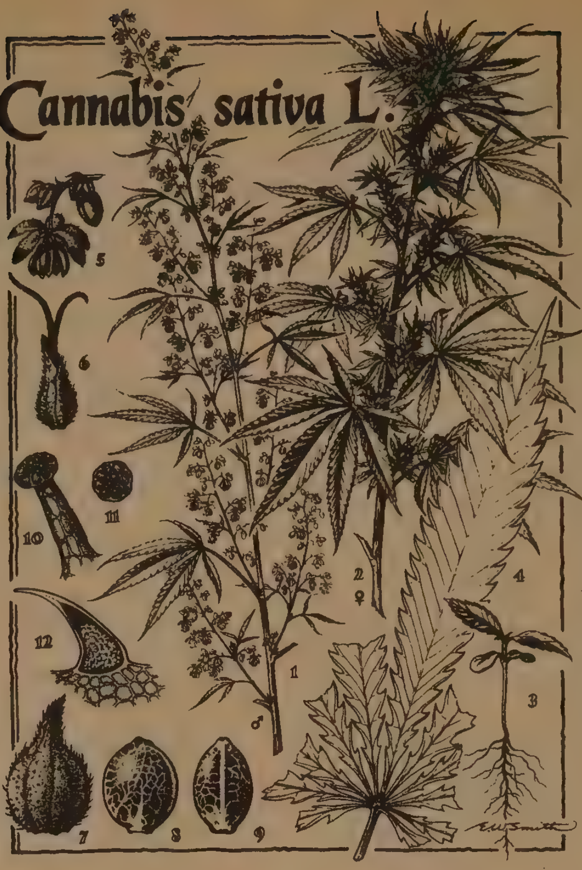
Acres, USA, August 1974, September 1974, February 1975.

Sinsemilla Marijuana

BY OTTO PEEP, MEMBER O.A.C.



(1) Top (distal portion) of male plant, in flower, (2) top (distal portion) of female plant, in fruit, (3) seedling, (4) leaflet from a large, 11-parted leaf, to show leaf variability, (5) portion of a staminate inflorescence, with buds and a mature male flower, (6) female (carpellate) flower, with stigmas protruding from enveloping hairy bract, (7) fruit enclosed in persistent hair floral bract, (8) fruit, lateral view, (9) fruit, end view (sagittal plane), (10) glandular hair, with multicellular stalk, (11) glandular hair with short, one-celled invisible stalk (sometimes called a sessile glandular hair), (12) rigid non-glandular hair containing a cystolith of calcium carbonate. Drawn by E. W. Smith.

From **The Botany and Chemistry of Hallucinogens**

Dedicated to J.I. RODALE, who wanted the best.

INTRODUCTION

The purpose of this book is to get everybody high for free. Five or six big healthy pot plants will supply a heavy smoker for a year with pure, organically grown, harmoniously-attuned grass. If the grower has the right attitude, caring for the plants, promising them a future for their seeds, he will be rewarded.

There are really two attitudes you can take to gardening. One is the never-get-dirty, buy it all in plastic bags, sterile, weed-free approach. The other, more favorable, is the self-reliant, make-do-with-whatever, get down dirty organic composting method. Compost has an almost magical effect. The very finest marijuana plants are grown on heavily-composted soil, in compost heaps, or where one once was. Compost works for you and your plants to increase fertility in the ground, activating natural micro-organisms that flood the soil with energy and life.

What is written is what I have observed.

MYTH & FACT

Disregard any advice about starving, dwarfing, making bonsai, torturing, or not watering to create difficult conditions. Don't give your plants a hard time, it won't make better smoke. You can get just as busted for 2 foot sick plants as for 8 foot giants, so grow for peak production and health, just like any vegetable. The result of maltreatment is reduced yield. Most of this "good advice" comes from those who have never grown any and they are repeating something they heard. A healthy, hunza female can produce over a pound of seedless wonder-weed with proper care and love, and understanding. Knowledge is the key.

This seedless method of growing grass is not for profit — because seeds make a plant heavier when sold — but it's supposed to be a lot more fun to smoke. There is also a new advantage to growing your own: grass is apparently much damaged and weakened in transport these days.

Otto Peep has changed her name to protect her plants. This is an excerpt from her book-in-progress Top Pop Pot, *"A Practical Guide to Home Growing."*

— Rosemary Menninger

Outdoors marijuana growing is a lot like growing tomatoes. They have very similar requirements, but unfortunately should not be grown together.

The problem for most people is the planting place. Those who have no garden with shrubbery nor woodlands close by should try moving to a better place or indoor culture.*

In California, the cops do not hassle growers of the backyard, personal-consumption variety unless they get a complaint or they can see it from their cars. Oregon is also quite loose. Texas seems much cooler now. Penalties are moderate to light, expect to lose the plants.

Other smokers are the real problem. They have a nose for it, and word gets around. Landlords and realty agents are dangerous, so have a story ready. Cheapo plastic greenhouses work fine for concealment, as do simultaneous plantings of giant sunflowers or tall sweet corn. Grass is decorative-looking and disappears in a formal garden — blends in well. Whatever you do, don't block the sunlight to the plants. A spot suitable for nude sunbathing is ideal. The growing site must get real strong sunshine most of the day. A southern exposure is the warmest and lightest. In some places, protection from the wind is needed.

If you do it in the woods, try to avoid pine trees and evergreens in general. These produce an acidic soil which will seriously stunt growth. Avoid swampy or salty spots. The loose soil along streams is ideal for woodland growing. If you have to plant under trees, do it on a south-facing slope, for maximum light. Be sure to test the pH of the soil carefully. Inexpensive pH test paper is available at garden stores. A pH of 7 to 8 (neutral to slightly alkaline) is ideal. Be sure to test both topsoil and the subsoil about 12 inches under.

STARTING RIGHT: YOU GET WHAT YOU PLANT

Get the right seeds. Personal tastes vary and the quality of seeds varies with their origin. The seeds you want are from the best stony weed you can find. Choose happy pot — avoid planting headache or sore-throat weed.

It's easy to beg a few seeds from someone with quality weed. Highs will differ depending on the genetics and origin of the seed. Climate and growth conditions determine how well the plant grows, not its chemistry.

•

***How to Grow Marijuana Indoors Under Lights, by Murphy Stevens**

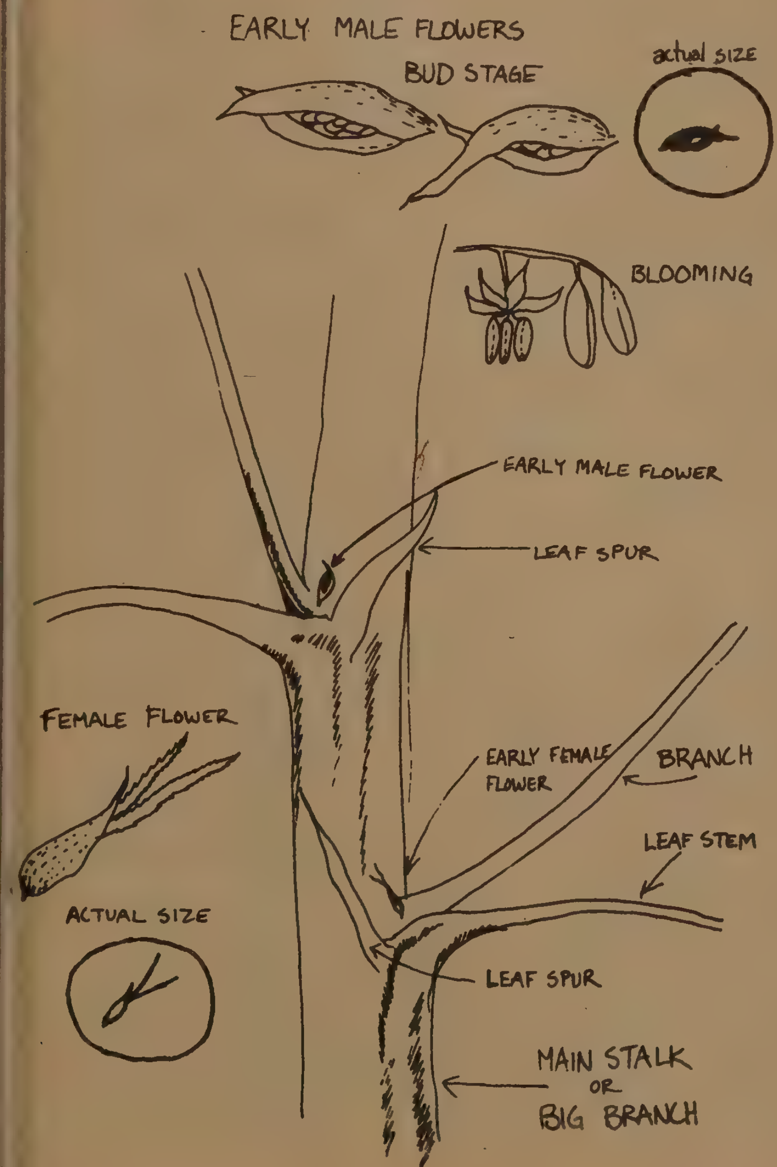
TO SEED OR NOT TO SEED

All you pot fans have heard of "sinsemilla". This translates to "seedless". What is it? It is female plants grown to full blossoming maturity without any male pollen reaching them. No pollen, no seeds. Why is this desirable? Seeds are the final, ultimate purpose of marijuana life, so the strong, female plant will make as many as it can (if you let it). Pot seeds are high in proteins, fats and stored sugars to start that baby plant. The plant will spend its entire store of nutrients and energy making pounds of seeds, not resin. If you are in business, seedy pot is a whole lot heavier than sinsemilla.

A few seeds are a good idea, 2 or 3 per top. It helps the plant remain convinced of its femininity. It is truly entertaining to begin crossing favorite types. Here is where the labels pay off. To select a male parent, pick one with strong, well-branched stems and healthy appearance that is also an early bloomer. Cut it off leaving one branch on the stump to bloom. Before the male flowers open, put a plastic bag around it and fasten tight. You can reach in later, pull off a few pollinating flowers, and blow pollen on a few select females. Perhaps only the bottom flowers should be fertilized and carry the seeds. It's wise to do this well before harvest when the females are just starting to bloom heavily, giving those few seeds a long time to mature.

I personally believe that seedless or very-slightly-seeded plants make more and better flowers with much higher high and a sweeter taste. Plants grown this way will continue to produce new flowers every day at the tips of each flower cluster until the tops are huge. Plants that have been heavily pollinated seem to stop growing new flowers right away, and throw all their energy into seed-making.

A favorite trick of the sinsemilla plant is to grow one tiny male flower or part of one at the very tip of a main flower cluster. Sharp observation daily will spot this little yellow banana. I pick them off. They don't seem to appear until the end of the growing season, just before harvest. That little male flower is your plant's stab at perpetuity — a female so hungry to reproduce that it can manipulate its hormones to fertilize itself.



The virgin sinsemilla plant waits and hopes, each day producing new flowers. The older flowers swell, the white feathers begin to change color to gold or even rose-pink. The calyxs, or seed jackets, thicken and develop a heavy layer of resin in droplets visible with a hand lens. If pollen still isn't forthcoming, the little flowers shrivel and turn brown. The smell knocks you down with its sweetness. The big leaves droop, yellow, and start to fall off. A slight gray tinge develops over the whole plant. The seeded plant will follow the same pattern when the seeds begin to mature.

•

SEX DISCRIMINATION

Most plants start to show what sex they will be in mid-August. This will vary with light, environment and heredity. How to determine sex early, before the main blossoming, is tricky to the uninitiated, because they don't resemble conventional flowers. The sooner you can tell what they are, the sooner the males are removed leaving extra light and space for the females.

The first signs of sex often appear on the main stalk about two-thirds up. Inside of a leaf joint, where one of the big leaves joins the stalk, a tiny flower or flower cluster will appear long before the flowers on the tops.

If it's a male flower, it will first resemble a miniature crab claw, or a tiny bunch of bananas. As it prepares to open, the largest banana will protrude from the cluster, develop a stem and actually look like a tiny flower bud. When it does open, it dangles, gives off yellow powder — the pollen — and looks like a tiny greenish flower, about ½-inch wide. On later days, more of the little buds open until the main bloom, when the plant is covered with little dangling dusty flowers.

If that first flower is female, it will look totally different. First it looks like a tiny rolled-up leaf ¼-inch long. A few days later two small white feathers will stick out of the pointed, unattached end of the little rolled leaf, which is the future seed jacket. The feathers on some plants stay small and almost colorless, on other plants they will reach one-half inch and turn a dazzling snow white. The little feathers are branches of the pistil seeking the pollen blowing in the wind. They are attached to the ovary, hidden inside the green cover.

These early flowers are tiny and often hard-to-find, or non-existent. Frequently there is only one early blossom on the whole plant. If your plants are crowded at all, get in there and hunt for these early indications. If you can find one female flower complete with feathers, that plant will be female, so mark it with something bright, and reliable. Once clearly marked you won't have to look at it again. If it looks male, wait until one flower develops and begins to open, then you'll be sure. Cut the males back to the ground or leave a bottom branch for pollination purposes if it's desirable for parenthood.

Some plants never show these early flowers, so watch the growing tips for main flower growth. In the male, you'll first see rounded clusters of tightly packed, broccoli-like buds, a lot seem to form at once. In the female development is less rapid; watch the leafy tips for white feathers in ever-increasing numbers.

Some plants have both male and female flowers mixed together. This is the famous Hermaphrodite, and is a real pest if you're trying to grow seedless. If that pollen gets around you may get screwy seeds that carry hermaphroditic tendencies, a possible problem in later generations. These bi-sexuals may or may not get you high, so take them out and smoke it while waiting for the real females to finish. Hermaphrodites seem to develop in the shadier, more difficult spots. Cannabis is usually bi-sexual only when threatened, and retains the ability to make both kinds of flowers all its life, but decides what the major will be in early life. Crowding and low-light levels result in more male plants. Wide spacing and long hours of light yield more females.** ■

**Great graphs in The Cultivators' Handbook of Marijuana, by Bill Drake

Shelter

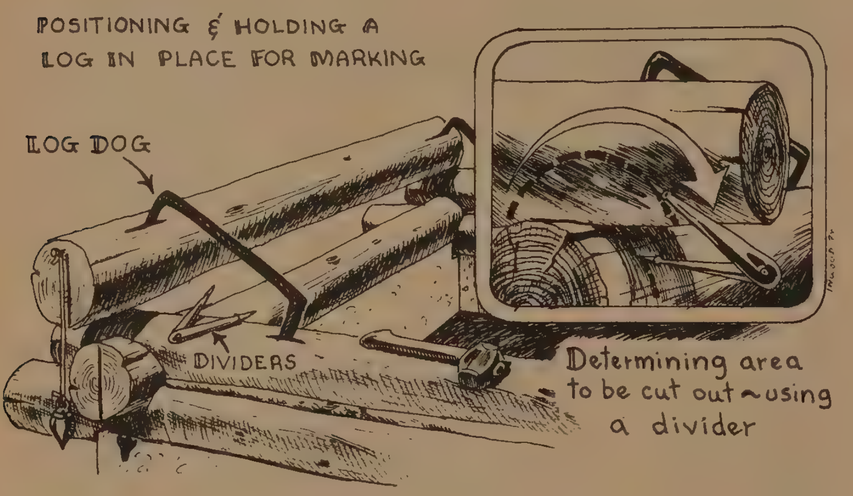
In Harmony With Nature

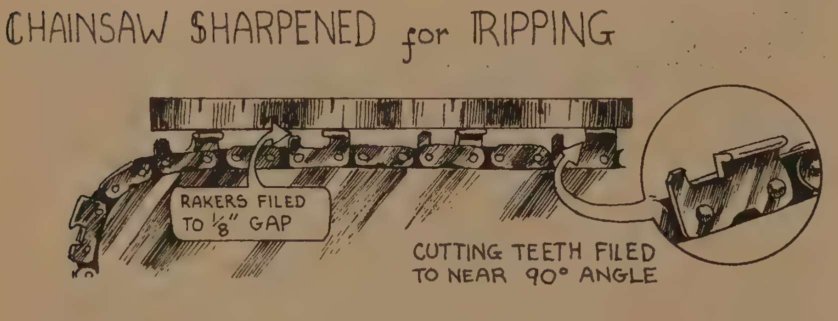
This is, by far, the best book on log house construction. It is new, long haired, beautifully detailed in its illustration, and applies both the use of the traditional tools (adze, axe, broad-axe, chisel) and the ever lovin' chainsaw. If you have a piece of land with some trees on it, I strongly recommend this book.

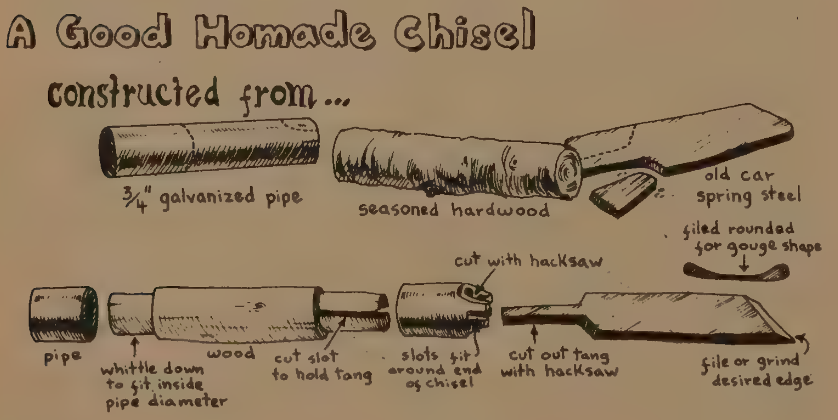
— J. D. Smith

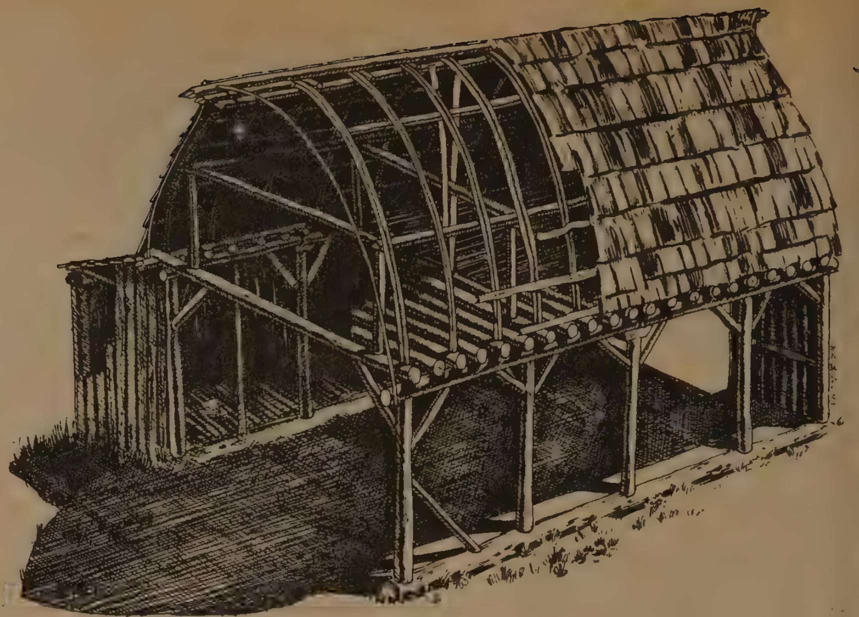
IN HARMONY
WITH NATURE
CREATIVE COUNTRY CONSTRUCTION
Christian Bruyere Robert Inwood

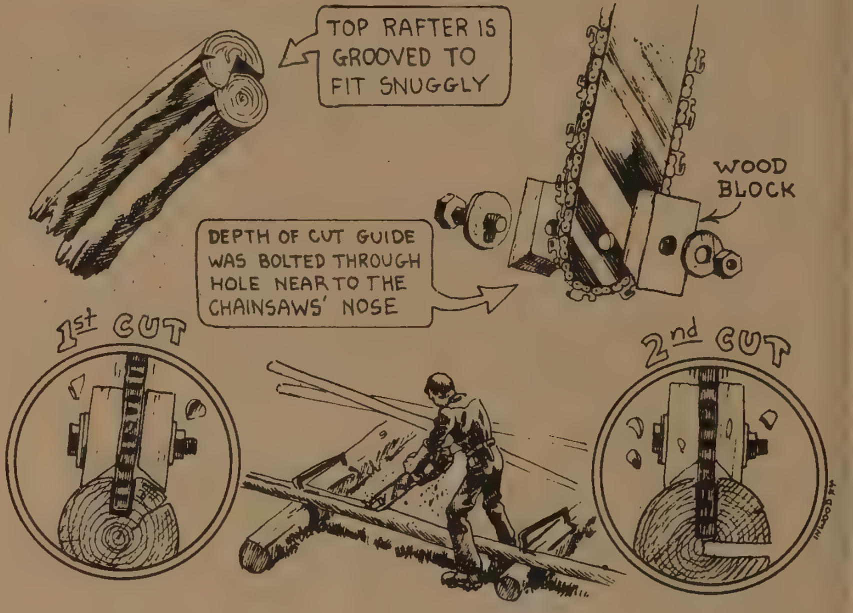
In Harmony With Nature
(Creative Country Construction)
Christian Bruyére and
Robert Inwood
1975; 213pp.
$6.95 postpaid
from:
Drake Publishers, Inc.
381 Park Avenue South
New York, NY 10016
or Whole Earth


POSITIONING & HOLDING A LOG IN PLACE FOR MARKING
LOG DOG
DIVIDERS
Determining area to be cut out ~ using a divider


CHAINSAW SHARPENED for RIPPING
RAKERS FILED TO 1/8" GAP
CUTTING TEETH FILED TO NEAR 90° ANGLE

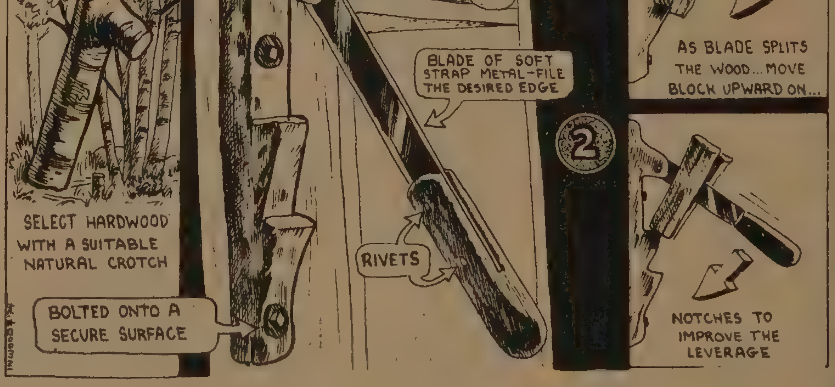

A Good Homade Chisel
constructed from...
3/4" galvanized pipe
seasoned hardwood
old car spring steel
filed rounded for gouge shape
cut with hacksaw
pipe
whittle down to fit inside pipe diameter
wood
cut slot to hold tang
slots fit around end of chisel
cut out tang with hacksaw
file or grind desired edge




TOP RAFTER IS GROOVED TO FIT SNUGGLY
WOOD BLOCK
DEPTH OF CUT GUIDE WAS BOLTED THROUGH HOLE NEAR TO THE CHAINSAWS' NOSE
1st CUT
2nd CUT

Long before we actually started construction, we put stakes around the proposed perimeter of the house. And every morning we came to the site from our nearby tent and inspected that area. Some mornings the area would seem very tiny, so we would enlarge the perimeter. Other mornings the area would seem huge. Those mornings we'd make it smaller. We soon began "playing house" in the area. We figured out where the various sections would be and how much space would be necessary for each. In the kitchen we measured areas for refrigerator, stove, sink, cabinets, and cupboards.

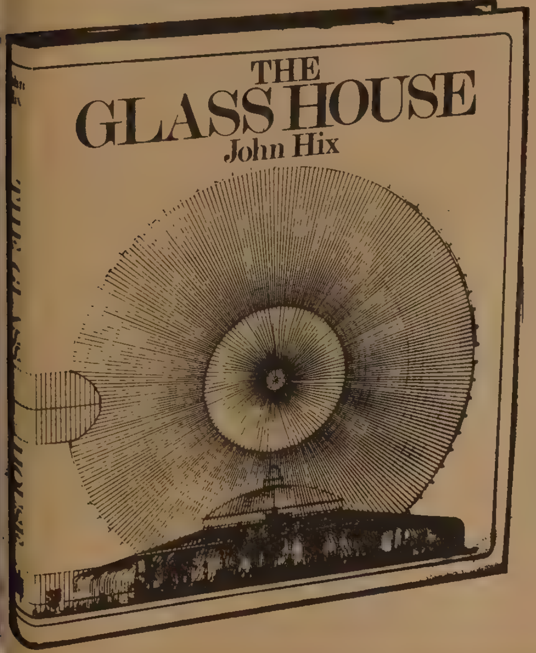
Then Janey would pretend to make a meal. I'd "go in the livingroom, stoke the fireplace, and sit down on the couch." I'd pretend to entertain friends. We'd pass each other in the hallway and sit down in the diningroom to eat. Though we didn't stick to plan for the finished product, we had a good idea of the space we needed. It turned out that 20' x 24' with an adequate loft area would be sufficient space for us — no immediate plans for enlarging our family.


KINDLING CUTTER
SELECT HARDWOOD WITH A SUITABLE NATURAL CROTCH
BOLTED ONTO A SECURE SURFACE
BOLT
BLADE OF SOFT STRAP METAL-FILE THE DESIRED EDGE
RIVETS
1
AS BLADE SPLITS THE WOOD... MOVE BLOCK UPWARD ON...
2
NOTCHES TO IMPROVE THE LEVERAGE

The Glass House

"Greenhouse", that is. Plants generally require much more sophisticated control of their environment than do humans, and so it isn't surprising that horticulturists know more about artificial climate than do architects. This elegant book reveals that much of the knowledge needed for the design of solar houses and "biospheres" has been known for more than 100 years! I was also quite surprised to find out how large some of the indoor agricultural projects were and are; for instance there are more than 17,000 acres of greenhouse in use today in the Netherlands. Mr. Hix doesn't furnish us with thermal performance figures, but he includes a juicy bibliography and a glittering collection of sharp photographs and drawings. A real find for indoor food-raisers and solar house designers.

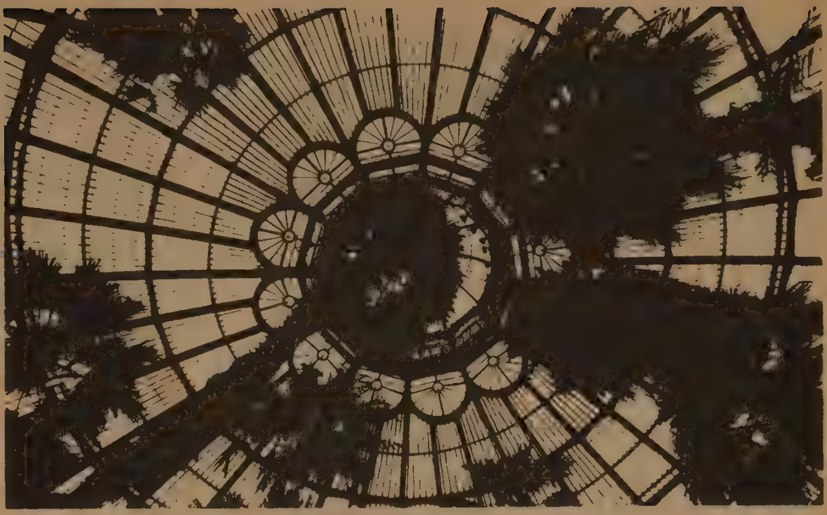
—J. Baldwin
[Suggested by Day Charoudi]



The Glass House
John Hix
1974; 208pp.
$22.50 postpaid
from:
The MIT Press
28 Carleton Street
Cambridge, MA 02142
or Whole Earth

W. Bridges Adams, a major proponent of iron and glass construction and an urban visionary of the nineteenth century, proposed stripping off the existing roofs of London terraces and replacing them with roof gardens.

. . . Gardens of this kind would be as in the East, the resort of the family in fine weather and in bad weather a warm greenhouse on the roof would be a more pleasant thing than a dark parlour. Scarcely anything could be conceived more beautiful than the enormous expanse of London roofs covered with shrubs and flowers. And it would be a perfectly practicable thing so to construct the greenhouses that they might be opened or closed at pleasure.



Palms in the dome of the winter garden, Laeken Palace, Brussels (1876).

One-acre pneumatic structure covering tomatoes near Wooster, Ohio. The polyethylene film is held down by a cable network. The polyethylene tube suspended from the cables, when inflated, carries heated or cooled air or CO_2 enrichment. Goodyear Tyre and Rubber Company.

Toilet "Gold-Ring"

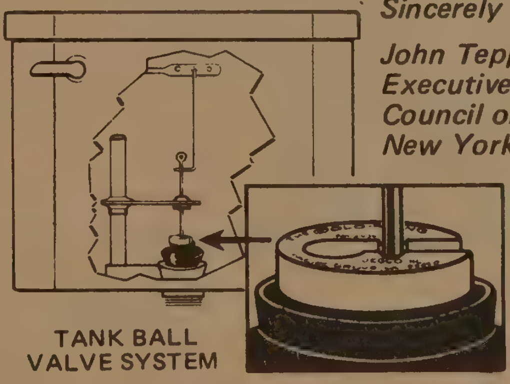
Dear Quarterly:

Michael Phillips in the last issue discussed the water conservation virtues of the Japanese toilet. I would like to add some additional commentary to this discussion by drawing your attention to the "Gold-Ring" which is an invention by a Mr. John Goldring (get it?) which converts a regular toilet emptying an entire tankful of water at every flush to a more economical dispenser of water which relies on the handle being down for continued flow of the tank. For the common chain plus flap toilet, the "Gold-Ring" can be duplicated by attaching a paperclip and heavy washers to the base of the chain thereby keeping the chain and flap down except when the handle is held down. The "Gold-Ring" however works in various different types of systems and comes complete with instructions for $2 from Mr. Goldring at Jegco Inc., 2016 Sunset Drive, Pacific Grove, CA 93950.

Mr. Goldring maintains that 44% of normal flush water requirements can be saved and over 30% of residential water consumption can be saved.

Sincerely yours,

John Tepper Marlin
Executive Director
Council on Municipal Performance
New York City



Nightwall

Dear Stewart;

I am enclosing a sample of our magnetic Nightwall. Peel off the paper strips — place it against a window — press firmly above the magnetic strips — then pull the beadboard away. The strips stay. You can pop the Nightwall on and off as you want.

A single glazed window without the Nightwall has a U factor of 1.1 (it loses 1.1 BTU per ft^2 per hour per degree Fahrenheit temperature difference). With the 1" beadboard blanket, the U factor is lowered to .25.

What does this mean in energy savings? Let's assume that the Nightwall is left in place during 3/4 of the heating season — put on at night, taken off during sunny days. (See chart below.)

A fuel cost of $2.5/kwhr is pretty high, but there are many places in the country where it is even higher.

What does Zomeworks sell to the customer? Beadboard is bulky stuff and expensive to ship. You can buy your own insulation locally and send for our clips and make the Nightwall panels yourself. We sell the magnetic clips — the branding iron for setting them, along with installation instructions.

Prices for 6" Magnetic Strips & Clips

20 (minimum order) and above	$.30/ea
40 and above	.28/ea
100 and above	.26/ea
1000 and above	.24/ea

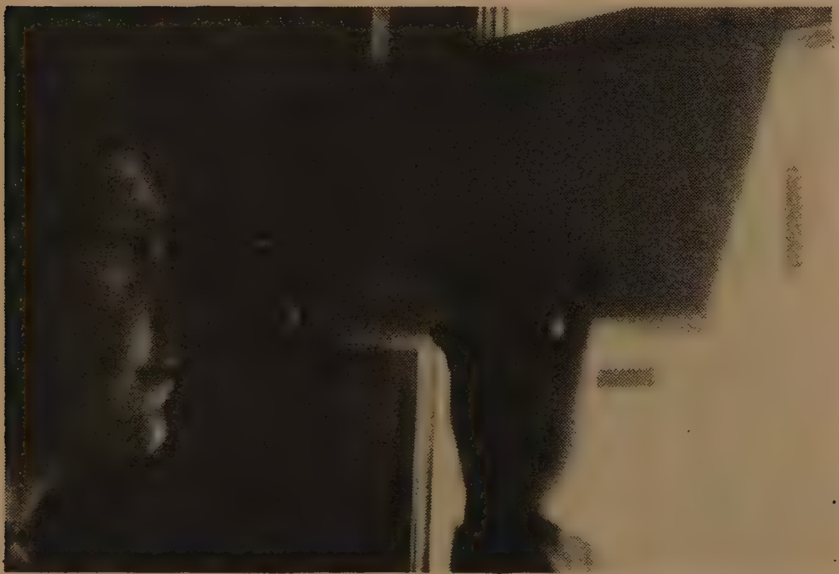
This price includes postage and handling to anywhere in the United States.

How many magnetic clips do you need? Roughly one clip for every 1-1/2' of perimeter around the windows. The Nightwalls are meant to fit one on each pane of glass. You can easily make 4' x 6' Nightwalls of 1" beadboard and our magnetic clips (16 of them). 1" beadboard costs about $.20/$ft^2$.

Some of the variations we will sell on these; snap on convective heaters and coolers — and hinged freon operated south wall sky-lids.

The Nightwalls can be painted with latex paints (the outside should be left white, or painted white) — individual pieces of beadboard can be glued together along the edges to make large panels out of scraps. Thicker beadboard (2") can be used by the conservation zealot for Super Nightwalls. Small Nightwalls can be used effectively over TV sets.

— Steve Baer
Zomeworks
Box 712
Albuquerque, NM 87103



A small sample of Nightwall being set on its magnets by Diana Fairbanks. The real thing would fill the entire windowpane.

Breadbox solar water heater

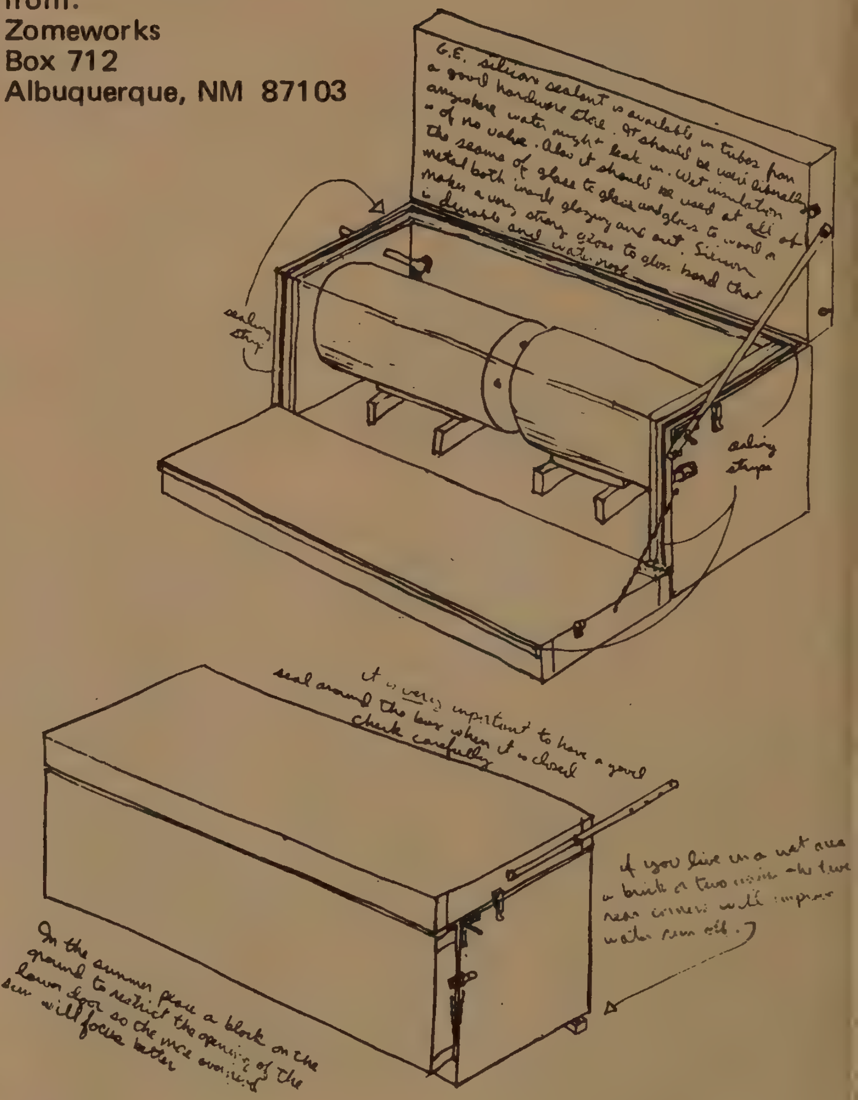
Zomeworks does it again. A solar water heater that needs no "collector". Steve Baer writes, "We have done a great deal of work on this kind of water heater and feel it is a good system for someone to build himself. They are bulky and heavy and are not very suitable for shop production and sale, but the simple construction methods make them right for backyard construction." Basically, the heater is a black water tank in an insulated box equipped with two glass walls to admit sunlight, and two insulated lids that reflect sun into the box during the day and close to keep in the heat at night. The plans are big, clear, and hand drawn in Steve's own inimitable style.

— J. Baldwin

Breadbox Water Heater Plans

$2.50 postpaid

from:
Zomeworks
Box 712
Albuquerque, NM 87103


G.E. silicon sealant is available in tubes from a good hardware store. It should be used liberally anywhere water might leak in. Wet insulation is of no value. Also it should be used at all of the seams of glass to glass and glass to wood or metal both inside glazing and out. Silicon makes a very strong glass to glass bond that is durable and waterproof
sealing strips
sealing strips
It is very important to have a good seal around the box when it is closed check carefully
If you live in a wet area a brick or two raising the two rear corners will improve water run off.
In the summer place a block on the ground to restrict the opening of the lower door so the more overhead sun will focus better

Location	Degree Days	BTU lost/ ft^2 single panel window	BTU lost/ ft^2 using Nightwall	BTU savings/ ft^2	$ Savings*
Chicago	6155	162492	68321	94,171	$ .69
San Fran.	3015	79596	33467	46,129	.34
Denver	6283	165872	69741	96,129	.70
Minneapolis	8382	2212284	93040	128,245	.94
Los Angeles	2016	54410	22877	31,533	.23
Portland	4635	122364	51449	70,915	.52
Houston	1396	36854	15496	21,358	.16
Fairbanks	14279	376966	158497	218,469	1.60

*Assuming energy cost of $2.5/kwhr — $7.32/1,000,000BTU

Solar hardware

"Inevitably the fields of Solar Energy and Refrigeration and Air Conditioning will become intertwined . . ." says this catalog of heat exchangers, collector plates and other goodies (including the new 4 Mil Tedlar glazing). This is typical of a growing number of companies that see what's coming.

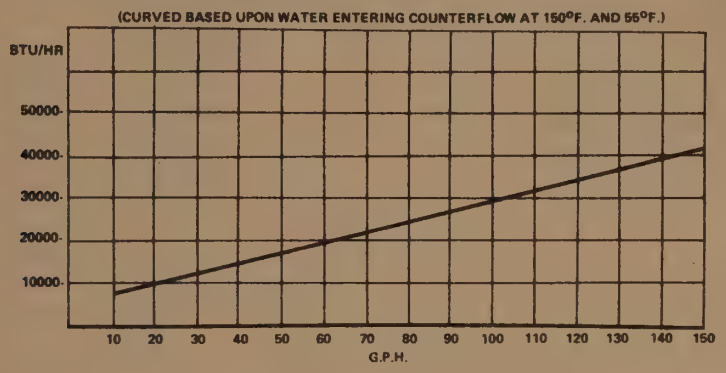
— J. Baldwin

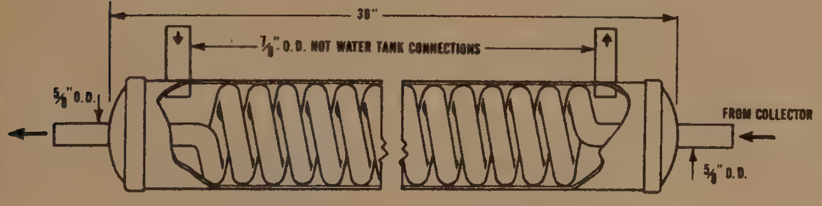
Components For Solar Energy Systems Catalog
Free (but I'd send $1.00)

from:
Refrigeration Research, Inc.
Solar Research Div.
525 N. Fifth St.
Brighton, MI 48116

TYPE II The No. 5840 heat exchanger is for various liquid to liquid applications. It may be used to provide heat interchange between liquid circulating from a solar collector and water to be heated in a water heater or pre-storage tank for the water heater. Depending upon the application, a circulating pump will be required in one or both of the water circuits.

Larger heat exchangers of this type are available upon special order. Capacity of the No. 5840 is indicated by the following curve:





PART NO. 5840

TYPE III Special heat exchangers can be made to special order. This includes special heat exchangers made for interchange between a solar collector system and absorption air conditioning system.

SolarSan collector panels

Plans for a flat plate collector that is a lot easier to make than most other designs and is claimed to be as little as $1.00 ft.^{2} for materials. Good performance is also claimed, though quoted tests are for San Diego which isn't much of a challenge. Completed panels sell for about the same as competing designs. If this panel works as well as they say, it will confound the higher-tech-the-better crowd. The price for the plans is as outrageous as the price of the parent **Solar Energy Digest.** *My experience indicates that the panels probably perform well.*

SED also proposes (March 75) that an economical way of making that big water tank needed to store energy would be to completely fill a properly prepared basement! Egad! That's actually a pretty good idea.

— J. Baldwin

SolarSan Plans
(and license, though it isn't patented yet)
$25.00

from:
Solar Energy Digest
P.O. Box 17776
San Diego, CA 92117

You can also buy complete SolarSan panels and other solar hardware from:

Solar Supply, Inc.
11404 Sorrento Valley Rd.
San Diego, CA 92121
$150.00 for a 2x8 panel
double glazed

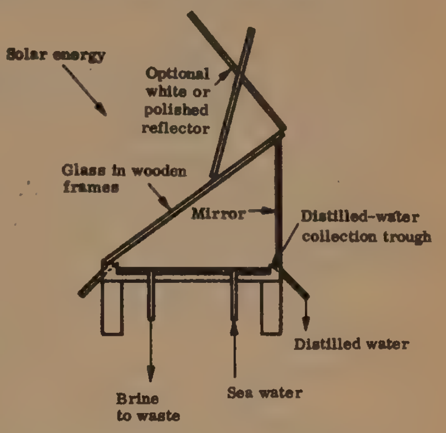
Solar Distillation

A typical, competent UN paper. Conclusions are that though solar stills are capital-intensive, they may be the most economical way to get water where seawater and sun are in good supply. They cite that 25 gallons per square foot of collector per year may be expected under average circumstances. Very comprehensive. Has graphs, formulas, drawings . . . everything you likely need to know. The economics of various schemes are examined more thoroughly than you'll likely read.

— J. Baldwin
[Suggested by Joseph LoMonaco]

Solar Distillation As A Means Of Meeting Small-Scale Water Demands
United Nations Department of Economic and Social Affairs
1970; 86pp.
$2.00

from:
United Nations Sales Section
United Nations
New York, NY 10017



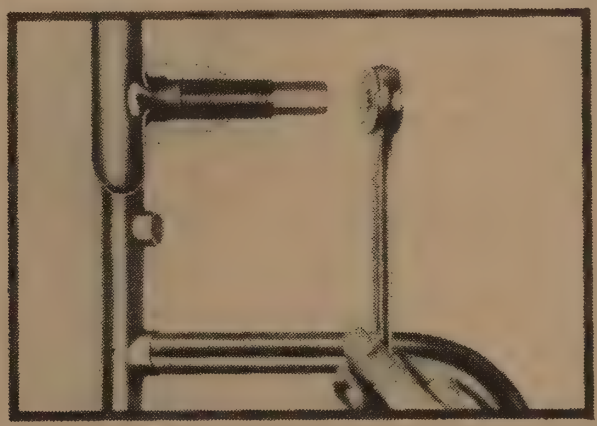
Aushalser

Uh, for those of you that don't know what an Aushalser is, it's a device that makes holes in the sides of tubes so you can attach other tubes there without T fittings. It's too expensive for the average toolbox, but if you have to make a bunch of manifold type flat plate collectors it could save you money. The joints are more reliable and cheaper than T fittings. The tool is made with typical German precision. They also make a nifty small tubing bender.

— J. Baldwin

Aushalser Kit
$200.00 and up (approx.)

from:
Rothenberger USA
7317 Cahill Rd., Suite 261
Minneapolis, MN 55435



More "solar cells"

Spectrolab, one of the big names in converting solar energy directly to electricity, claims that recent developments have made their panels cost competitive with conventional hardware in many applications. This is probably true, but it still isn't cheap. Main advantage is simplicity and reliability; there aren't any moving parts. There has been a steady decrease in the price of such equipment. Maybe someday soon it will be practical for domestic power. They also make a nice Pyranometer, a device for measuring sky and diffuse solar radiation (about $1,100.00).

— J. Baldwin
[Suggested by Kirk Bailey]

Spectrolab LEC
(Light Energy Converter)
Catalog
Free

from:
Spectrolab
12484 Gladstone Ave.
Sylmar, CA 91342

Solar building code

A proposal for adapting an energy-saving ordinance and solar building code for the city of Davis, California. This report has been well received by the city government and will likely be adopted with some modifications. A surprising result of the study is the finding that household energy use could be cut about 50% with little or no degradation of service and without resorting to bizarre architecture or sophisticated hardware. Merely installing good insulation and, for instance, shading windows in summer can cut energy use dramatically in conventional structures. The effect is much greater than had been supposed. Properly designed new buildings could show even better savings. Recent work of the authors indicates that if approximately half of the money needed for a proposed nuclear power plant was spent giving insulation to the homes it would serve, the energy saved each year would exceed that generated by the proposed plant, which would then not have to be built!

I consider this report to be very important. It is competently researched with actual measurements, and is well presented. With figures changed to fit local climate, it could well serve as a model for communities now considering similar ordinances.

— J. Baldwin
[Suggested by David Bainbridge]

A Strategy For Energy Conservation
(Proposed Energy Conservation and Solar Utilization Ordinance for the City of Davis, Calif.)
Jonathan Hammond, Marshall Hunt, Richard Cramer, Loren Neubauer
1974; 51pp.

$5.00 postpaid

from:
Living Systems
Rt. 1, Box 170
Winters, CA 95694

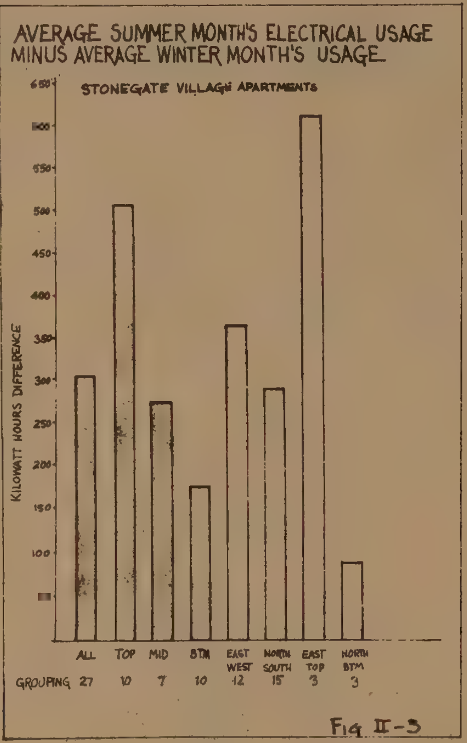


Fig II-3

Energy use data for 27 apartments in another portion of the Stonegate Village complex was obtained and analyzed. (The data was provided by the Davis Office of the Pacific Gas and Electric Co.) Figure II-3 shows the results obtained by subtracting the average winter month's electrical usage from the average summer month's usage. This was done to emphasize the energy consumption dictated by the architectural design of the units.

The top floor apartments were twice as energy consumptive as the middle floor apartments, and nearly three times that of the bottom floor apartments. The very high usage figure for the top floor apartments is due to inadequate roof design. The top east side apartments were the most energy consumptive because they not only had unsatisfactory roofs but also receive early morning direct solar heating through the large east facing windows. In these apartments the air conditioner must start early in the morning and run all day.

■

The Roof

When it is time to re-roof use a light colored material; it will be 60° cooler in the sun than a dark material. Aluminum roofing is also cool in the summer. Rigid insulation can be added on top of the roof deck.

Roofs should be shaded by trees located on the east and west.

Practical methane

Here's a minutely detailed paper proposing a methane-fertilizer plant for a dairy having 350 cows. The conclusion is that it will "pay" (in the commonly accepted sense of the word); about breaking even on methane alone, not counting fertilizer production. With a little luck, it should be operational by Sept. '75 and then we'll know. The concepts of net energy have been duly recognized; a rarity. Serious builders of bio-gas facilities would do well to read this all carefully. It's a model of what such a paper should be.

— J. Baldwin

Process Feasibility Study:
(The Anaerobic Digestion of Dairy Cow Manure at the State Reformatory Honor Farm, Monroe, Washington)
Ecotope Group and Parametrix, Inc.
1975; 119pp.

$8.00

from:
Ecotope Group
Box 5599, University Station
Seattle, WA 98105

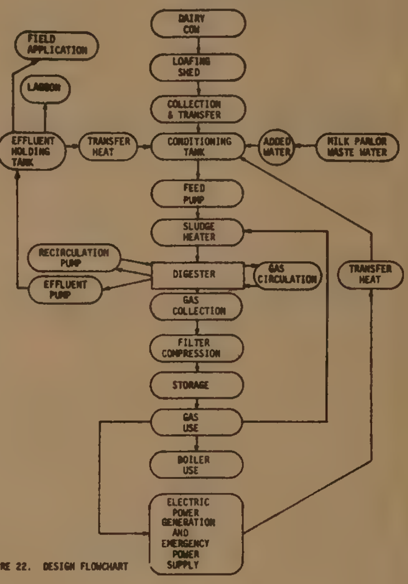


FIGURE 22. DESIGN FLOWCHART

A feasibility study has been completed. Manure from 350 cattle units (one cattle unit = 1000 pound animal) dairy operation will be scraped from loafing shed and deposited into the digester to produce a combustible gas and ammoniated nitrogen fertilizer. Digester tanks will be an existing product which can be purchased at a reasonable cost. Digestion technique will utilize high rate gas recirculation mixing. Net production (after heating needs) of bio-gas (600 BTU/cu ft) was estimated to be 7500 to 9500 cu. ft./day in cold and warm seasons respectively. Bio-gas will be used to replace #2 fuel oil, BTU replacement savings estimated to be $4488.00/year. Fertilizer earnings are based on transformation of organically bound nitrogen to the ammoniated form. This was estimated to be 8 tons/year for earnings of $6344.00/year to replace ammoniated nitrogen fertilizer. Total direct cost of system was estimated to be $56,700.00. Evaluation of scale of project shows the amortized cost per cattle unit is near the break-even point for investment payback from bio-gas earnings alone.

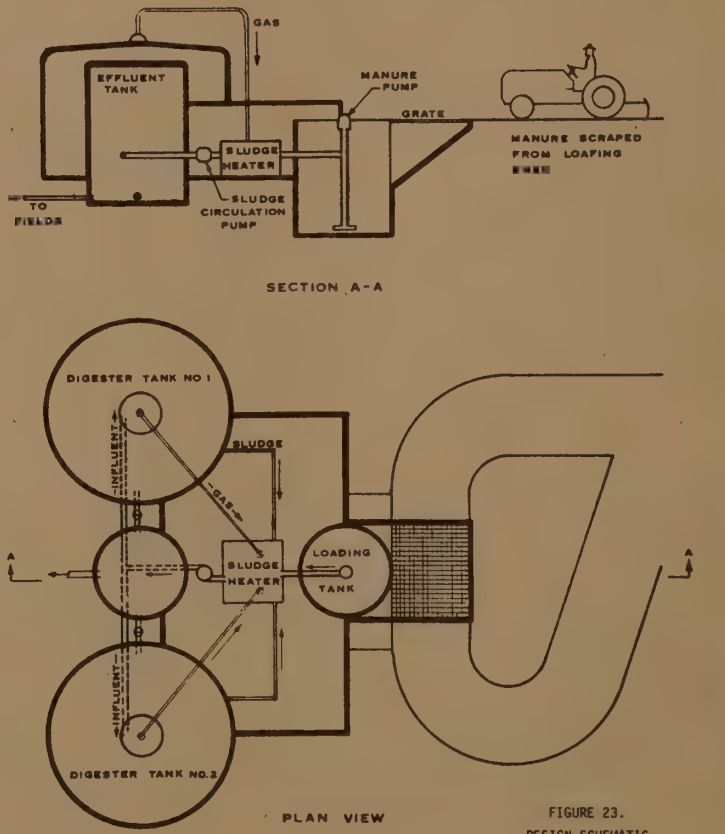


FIGURE 23.
DESIGN SCHEMATIC

Zero Waste Systems

People,

I work for the outfit on the letterhead. We've been working on recycling industrial waste for the past year and a half — tons of waste chemicals, plastics, solvents, heavy metal sludges, acids and other hazardous wastes. Anybody who works for an institution producing any of the following wastes should get in touch with us — we recycle from troy ounces to tons of the following:

Trichlorethylene, III-Trichlorethane, isopropyl alcohol, most wastes from the electronic and printed circuit industries (e.g., gold, methylene chloride strippers, alkaline etch for copper, etc.), freons, perchloroethylene, clay (kilotons only), propylene- and ethylene-glycol ethers, polyethylene, waste oil, "saran", mahogany, methyl ethyl betone, crates, all types of laboratory chemicals.

In fact, we will handle almost any non-radioactive wastes if we think the economics will be favourable, and we'll set up programs to handle them. On the other hand, we have recycled bulk chemicals and many other materials available at low prices — surplus laboratory chemicals, printed circuit board making material at 1/10th price, sheet mylar at 1/3 price, recycled fuel for backwoods heating or electricity generation at 10-20¢/gal., 55-gal. steel drums, etc.

We also do consulting work. One of the ways people hear about us is when they attempt to legally dump some nasty poison — various state and federal officials refer dumpers to us for advice or purchase of the waste. We're also the only profit-making corporation which is a member of the Sierra Club, and the only waste clearing house in the U.S., one of three in the world outside China.

We specialize in low energy approaches, reusing a material with minimum or zero processing, taking a waste from an industry with high purity requirements to an industry with lower purity requirements, or marketing a material which is a waste due to mixture with another material by finding someone who mixes the two together for their process. We also use low technology — practically all the technology for recycling industrial waste is not only known, it's 19th Century.

Yours,

Trevor Pitts

Zero Waste Systems, Inc.
2928 Poplar Street
Oakland, CA 94608

Notes

Alternative energy researchers may miss interesting projects by not being on the bidders list of the Federal Energy Administration (write to Paul R. Woods, Officer of Contracts and Procurement, Room 8439, Federal Bldg., 12th and Pennsylvania, NW, Washington, DC 20461). On the other hand, if you've had a proposal in solar energy denied by any Federal agency, Senator Gaylord Nelson wants to hear from you (write to Mr. Jeff Angus, Research Director, Sen. Gaylord Nelson, US Senate, Washington, DC 20510). That first tip comes from someone unsigned at the Independent Petroleum Association of America, the second from William Edmondson's May issue of **Solar Energy Digest.**

Wind Power Digest is a new publication providing access to wind equipment and designs. First issue is $2 from Route 2, Box 489, Bristol, IN 46507. We learned of them from **Not Man Apart.**

The Farallones Institute is running study & apprenticeship programs in shelter and soft technology. Fees are $750 per ten-week session; $2,250 per academic year. Write Farallones Institute, Box 700, Point Reyes Station, CA 94956.

Energy, Environment and Building, whose preliminary form we lauded in the EPILOG (p. 527) is now ready. The exhaustive compendium by Philip Steadman costs $5.95 from Cambridge University Press, 510 North Ave., New Rochelle, NY 10801, or Whole Earth.

Zephyr Wind Dynamo, Willard Gillette's wind machine (EPILOG p. 537) is now in production, costing $2,687 from Box 241, Brunswick, ME 04011. J. Baldwin considers it a good design with low cost for high efficiency and good utilization of stronger winds.

Solar garbage grinder revisited. Dave Caulkins writes, *"Heinz Von Foerster's Solar Garbage Grinder for radio-active waste (EPILOG p. 531) has been improved upon by T.A. Sargent and T.N. Gautier of the University of Arizona. They calculate that it takes less energy to achieve escape velocity from the solar system than it does to dump garbage into the sun. This is so because almost all of the earth's orbital velocity must be subtracted from the garbage to hit the sun, while only about 41% more than the earth's velocity must be added to get out of the solar system. For those concerned about becoming the first interstellar litter bugs it is also possible to send the garbage into the gravitational field of Jupiter in such a way that it ends up in the sun at no extra cost (other than that of a very accurate guidance system)."*

— SB

An alternative technology equipment directory

A less expensive, less complete, more recent guide to soft tech gear than The Energy Primer *(EPILOG p. 527). Some non-duplications may make it worth having both.*

— SB

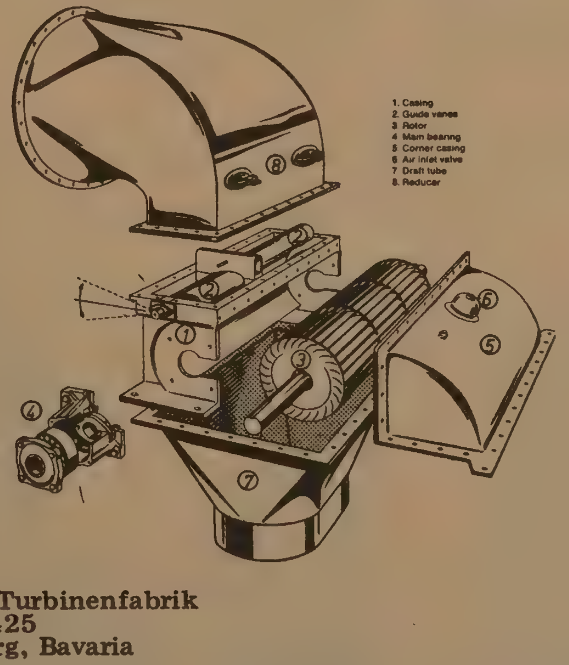
Spectrum
(An Alternative Energy Equipment Directory)
$2.00 postpaid
from:
Alternative Sources of Energy
Rt. 2, Box 90A
Milaca, MN 56353

Amana Refrigerator Co.
Amana, IA 52203

Frost-free and manual defrost models are available with extra insulation and other energy conserving features. They claim the manual defrost model can save as much as 60% over other refrigerators.

Philco-Ford Corp.
Union Meeting Rd.
Blue Hill, PA 19422

They have several refrigerators with added insulation and more efficient compressors and motors. Savings in energy of from 30 to 50 percent are claimed.



Ossberger-Turbinenfabrik
P.O. Box 425
Weissenburg, Bavaria

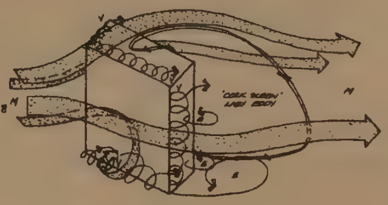
The patented "Ossberger" water turbines made by these folks are suitable for small-scale hydro-electric, pumping, or direct drive applications. They have been installed for saw-mills, shops and remote villages in many parts of the world. Some installations pay for themselves by selling electricity into the power grid in their communities when not using it themselves. They can operate on water head (drop) as small as 1 meter.

Design With Wind

The idea of integrating wind generators into the structure of buildings is not new, but on the other hand it hasn't been done yet. This MIT Master's Thesis gets things started with some sharp research conducted with wind tunnel models. Mr. Coonley finds that wind velocity can be raised as much as 4 times by conducting it through a properly shaped and located hole, and that such a hole can use wind approaching from as much as 70° to the side. Power in wind rises as the cube of the speed, so there is a nice advantage in combining architecture and windpower devices. More advantages appear as windload on the building is reduced as is wind blast at street level. The paper is less rigorous discussing other aspects of windpower such as advantages and disadvantages of the several types of wind machines; apparently the author has not had much experience outside the wind tunnel. Nonetheless, this is a good start towards what is likely to be a practical use of wind. The book includes lots of graphs and diagrams.

— J. Baldwin

Design With Wind
Douglas R. Coonley
1974; 148pp.
$41.25 (paper) postpaid
$22.00 (microfiche) postpaid
$11.00 (microfilm) postpaid
from:
MIT Micro Reproduction Lab
Rm. 14-0551
Cambridge, Mass. 02139



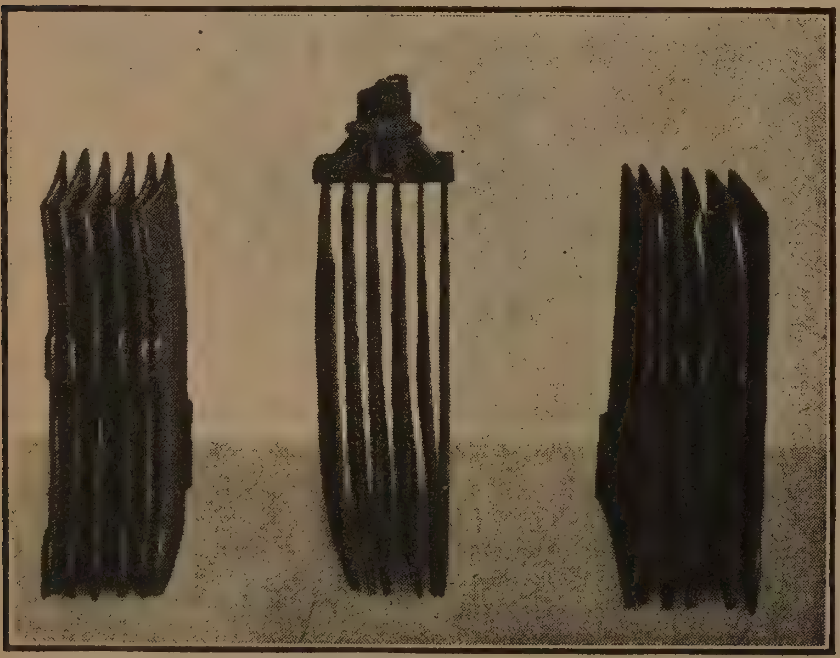
Storage Batteries

This highly technical text is the complete Word on batteries. Though not directly aimed at wind generator system storage problems, you can find the information you need by combining information from various chapters. Considering the subject matter, it's surprisingly easy to understand. One of the oldies-but-goodies.

— J. Baldwin
[Suggested and actually read all the way through by Jim Bukey]

Storage Batteries
George Wood Vinal
1924, 1955; 446pp.
$19.25 postpaid

from:
John Wiley & Sons, Inc.
One Wiley Drive
Somerset, NJ 08873
or Whole Earth



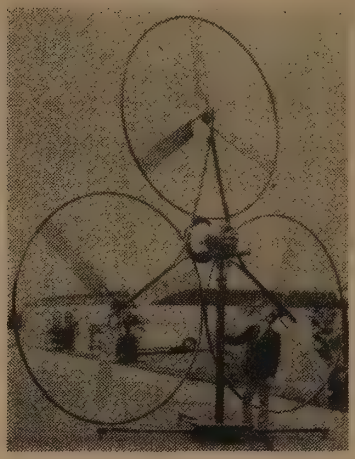
Buckled plates. There are a number of causes for this, but perhaps the most common is undercharging.

Salter wind turbine

Another contender for the practical wind machine market is this triple affair. The basic idea is good, as it eliminates the need for expensive and unreliable blade control mechanisms. Taking power from the rims gives high generator speed without gearing. Output per dollar is high. 5KW for less than $3000.00 is claimed. But I'll bet testing for heavy weather effects and ice hasn't been done yet, and if it hasn't it will be awhile before you can buy one. Inventor Edmund L. Salter should be applauded for his simple concept. Most engineers are heading the other way.

— J. Baldwin

Wind Power Systems, Inc.
information from:
Wind Power Systems, Inc.
P.O. Box 17323
San Diego, CA 92117



Parish Windmill

Another water pumping windmill, this one avoiding troublesome oil-filled gearboxes by substituting a large dry-running chain drive. Might be a real advantage, might not, but the choice of available models and types of machines continues to grow. This one is exceptionally easy to repair.

— J. Baldwin

Parish Windmill (improved)
$595.00 - $1,090.00
(minus tower and pump jack)
from:
K.M.P. Lake Pump Mfg. Inc.
P.O. Box 441
Earth, TX 79031

Do-It-Yourself Patent Applications Kit

This is one of those things that drives me up the wall. If the US Govt. wasn't drowning in petty bureaucrats, it would publish this kit which is the only clear explanation of how to use the Patent Office I've seen. They don't, so this kit will save you asking an attorney how to do it (most will charge you for that) or reading up on it, with the accompanying risk of not reading it right. In a sense, the kit is a great bargain, and in another sense (the hysterical fee) it's a maddening rip-off. Argh! Included is virtually everything you need to file an application except the money order for the fee and a stamp, neatly packaged and very clearly explained by means of a sample application. (You'll need an invention too.)

— J. Baldwin

Flipper-Do-It-Yourself-Patent-Application-Kit
$15.00

from:
Flipper Co.
1046 Dodge Avenue
Evanston, IL 60202

A Manual On The Hydraulic Ram For Pumping Water

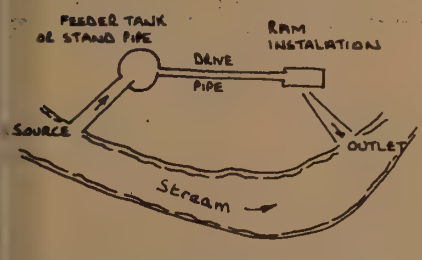
Excellent, extra-clear plans for making your own hydraulic ram water pump from standard pipe fittings. This paper is good news indeed, as commercially available rams are expensive (though more efficient) [CATALOG p. 71]. In case you just came in, a hydraulic ram is a motorless water pump that can raise water much higher than the source by sort of bouncing it up the pipe on a cushion of air, a fine idea that works well. You have to have a source of at least 5 litres/minute to make this one work. It'll ram best to a height about 3 times higher than the source head, but it can pump much higher; as high as 150 meters from a 3 meter head! If you need more water delivery, you can make a row of rams working side by side. VITA [CATALOG p. 68] has a similar paper available too; though for smaller water systems.

— J. Baldwin

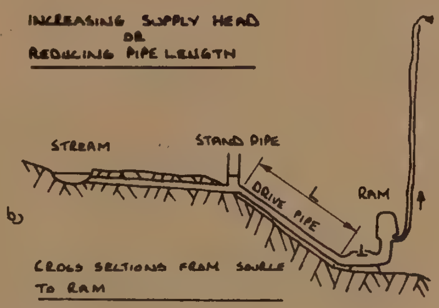
A Manual On The Hydraulic Ram For Pumping Water
S. B. Watt
1974; 37pp.

We lost the price.
It's about $4.00.

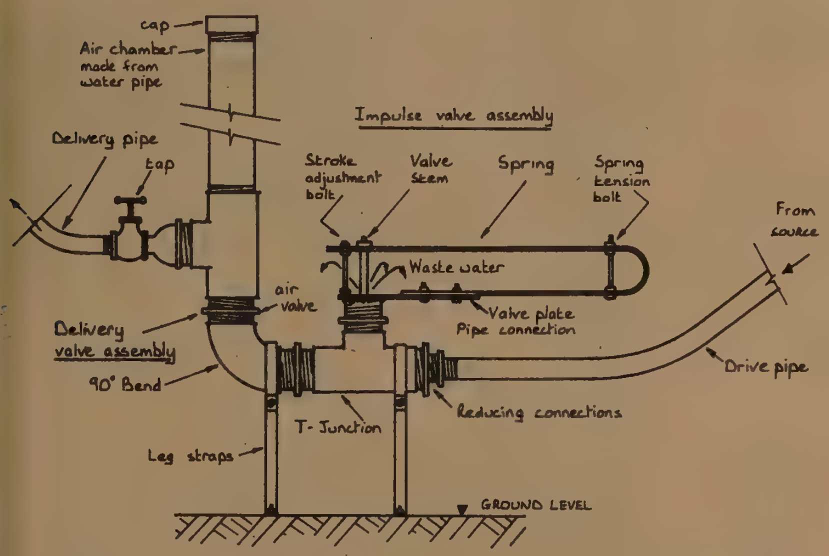
from:
Intermediate Technology Publications, Ltd.
9 King Street
London WC2E 8HN
England



PLAN ON RAM INSTALATION.



CROSS SECTIONS FROM SOURCE TO RAM



Small Hydroelectric Systems

Small Pelton Wheel suitable for powering a domestic generator. This type of turbine requires considerable head and uses high pressure water to get surprising power from a small wheel (18"). They sell buckets for making your own machine, kits, assembled turbines and complete systems, as well as numerous parts. They also can supply alternators and power transformers. This would be a good way to go if you live near a high head (50 ft. and up is best) water supply. These were used a lot to power California gold mines.

— J. Baldwin

Catalog
Free

from:
Small Hydroelectric Systems
P.O. Box 124
Custer, WA 98240

Air powered pump systems

Before city power and water, one of the ways to have a pressurized water system was to have an air compressor run by whatever machine (tractor?) you had around to charge a compressed air tank. Air from that was piped to the air-driven pumps submerged in the well or cistern. The result was pressure at the faucet on demand without the necessity of a water storage tank. These systems were well adapted to intermittent power sources and might be useful for some "alternative" energy powered outfits. You can still get the hardware! The catalog is the original 1923 edition and is an education in itself.

— J. Baldwin

Air Operated Fresh Water Pumps
$257.50 - $339.50

from:
Stauffer's Machine Shop
Pump Div.
R.D. #3
Ephrata, PA 17522

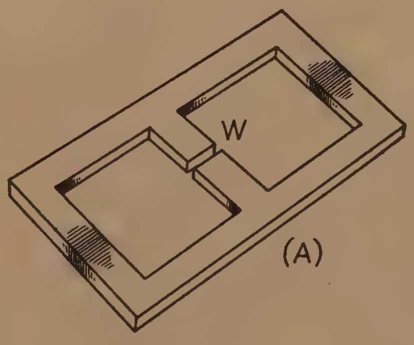
The Oxy-Acetylene Handbook

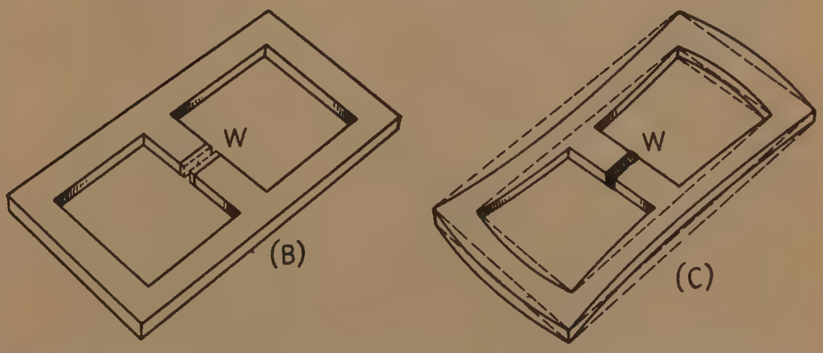
The corporations that make the product often publish the best manuals on how to use it well, in the hopes of encouraging further sales. So it is that Union Carbide brings us this authoritative textbook at a very fair price. (You'll still need an experienced instructor though.) Comprehensive, to say the least.

— J. Baldwin

The Oxy-Acetylene Handbook
Union Carbide Corp.
1943, 1972; 592pp.
$4.95 postpaid

from:
Union Carbide Corp.
270 Park Ave.
New York, NY 10017



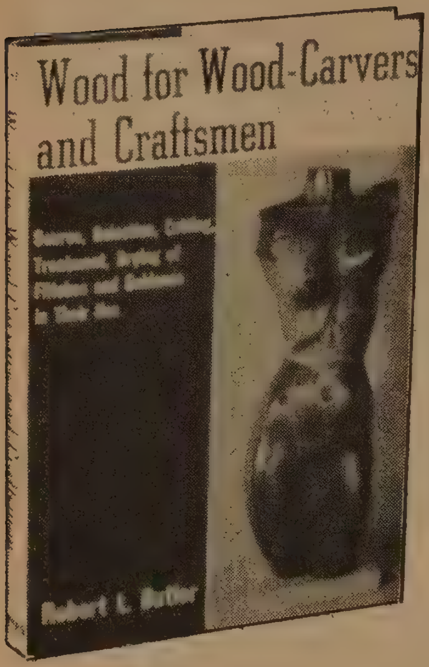


Here, step by step, is illustrated the effect of expansion and contraction in making a weld in a restrained part. Ductility is of great importance in this example.

Wood for Wood-Carvers and Craftsmen

"Wood is where you find it," and how you handle it. An inveterate wood scrounge, this man knows his stuff and says it clearly, albeit a little dryly. A valuable tool.

— Diana Sloat



Wood for Wood-Carvers and Craftsmen
(Source, Selection, Cutting, Treatment, Drying of Flitches and Guidance in Their Use)
Robert L. Butler
1974; 122pp.
$9.95 postpaid
from:
A. S. Barnes & Co.
Box 421
Cranbury, NJ 08512
or Whole Earth

The most important item is some type of temperature control unit which will contain paraffin or candle wax. A deep-fat fryer is excellent if temperatures below 212°F can be maintained. A double cooker does this inexpensively and it can be assembled from the kitchen without so much as a raised eyebrow from your spouse. . . The paraffin can be purchased in pound blocks at the grocery store from the canning supplies section. This is paraffin used for sealing preserves and jellies. I have found Gulfwax 33 manufactured by the Gulf Oil Company the best. It has a melting point of 133°F and spreads as lightly as water when heated to 170-180°F. It comes in 55-pound cases at almost one-third the cost of paraffin purchased at the grocery store. . . Be sure the largest end of the flitch is squared. During the drying and storage period it will stand on end so that the air can circulate to all unparaffined surfaces. Brush both ends clean and apply hot paraffin in a thin and penetrating coat. Penetration of the paraffin is assured only if the surface is dry and warm. A test of the correct technique is to observe whether or not the applied paraffin is transparent, that is, the annual rings and the wood structure are readily observed through the coat. If, however, the application is opaque, one or two or both requirements have not been met. If the surface is wet, paraffin cannot fill the excised cells. An opaque layer is an indication that there is an air space between the paraffin and the wood structure. In time it will chip off, moisture will be lost too rapidly from the ends of the flitch, and checking will follow.

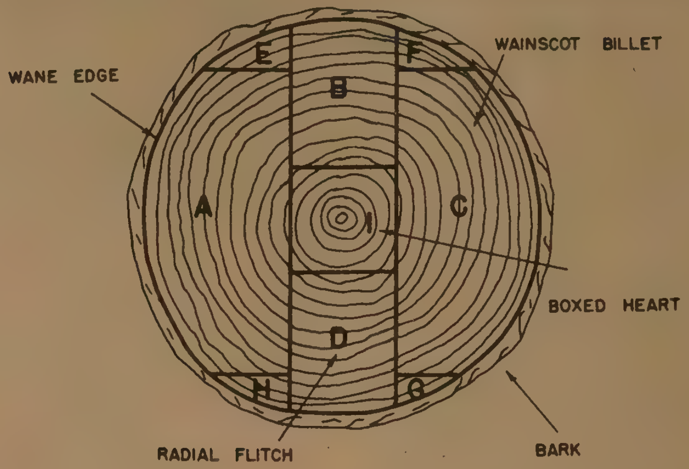


Diagram of flitches (A through H) that should be cut from a log without defects. Wainscot billets (A and C) are for large carvings; flitches B and D are radially sawed but smaller flitches; and E through H are of least value. The heart with pith (I) should be "boxed out" (discarded). It is a section highly susceptible to checking.

•

Wood is where you find it. Neatly stacked piles of hardwood often contains species of unusual color and grain. The treetop left following the removal of veneer or peeler logs, or an old orchard that has finished its days of bearing fruit or nuts contains a gold mine for the carver. Clearings made by a bulldozer for roads and building sites often contain many worthwhile logs that the construction boss is happy to have removed.

The author's lode of flitches, representing many domestic species in a great variety of shapes and sizes.

Let's Try Mushrooms for Color

MUSHROOMS? Rich earthy colors. Why not for inks and textile printing as well as for yarns. (Must admit I haven't tried 'em yet, but am I intrigued!)

Tiny book contains identification, mordanting, dyeing instructions, extensive table of species with colors obtained and tear-out cards for cataloging your own experiments. (Note: Author's instructions on handling poisonous mushrooms — "DON'T.")

— Diana Sloat

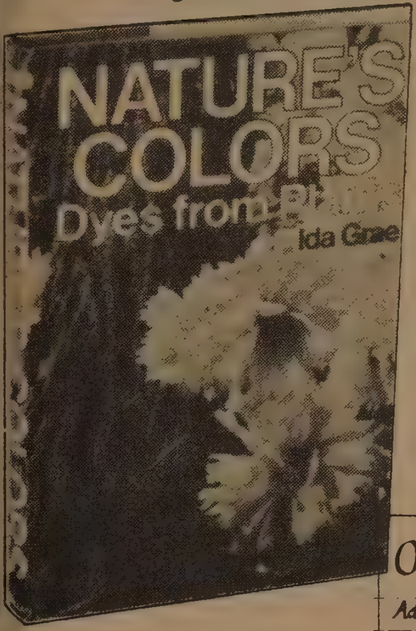
Let's Try Mushrooms for Color
Miriam C. Rice
1974; 40pp.
$2.95 postpaid
from:
Thresh Publications
443 Sebastopol Avenue
Santa Rosa, CA 95401
or Whole Earth

Nature's Colors

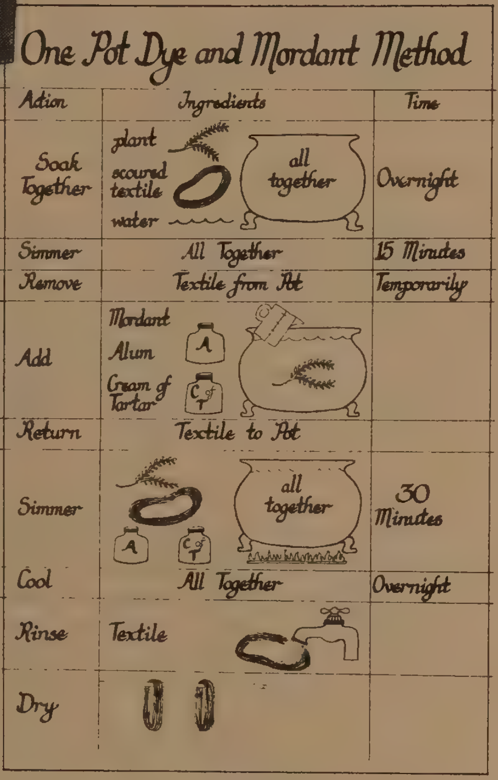
Most exciting natural dye book for the Westerner. Extensive coverage of all aspects of dyeing. Ms. Grae's free-wheeling experimental approach will lead you to anything as a dye source: trees, weeds, shrubs, garden plants, and one might suspect, household "pets"!

Have you tried lupine (yellow-greens), fennel (golds), raw olives (maroons), pigweed in iron pot (khaki - forest), silver dollar eucalyptus (red-bronze) . . . ? Careful, if you own this book nothing will ever be safe from the clippers again.

— Diana Sloat

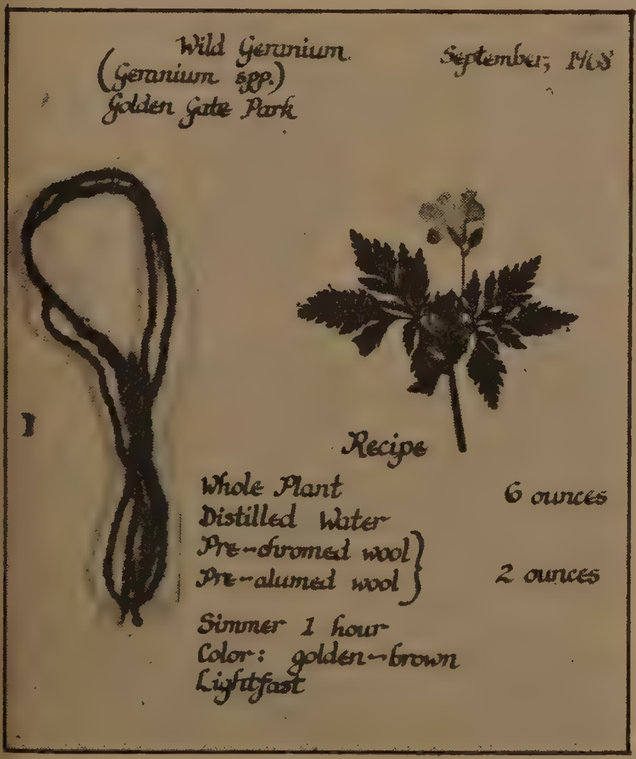


Nature's Colors
(Dyes from Plants)
Ida Grae
1974; 221pp.
$14.95 postpaid
from:
Macmillan Pub. Co., Inc.
Order Dept.
Front & Brown Streets
Riverside, NJ 08075
or Whole Earth



One Pot Dye and Mordant Method

Action	Ingredients	Time
Soak Together	plant scoured textile water all together	Overnight
Simmer	All Together	15 Minutes
Remove	Textile from Pot	Temporarily
Add	Mordant Alum Cream of Tartar	
Return	Textile to Pot	
Simmer	all together	30 Minutes
Cool	All Together	Overnight
Rinse	Textile	
Dry		



Wild Geranium
(Geranium spp.)
Golden Gate Park

September, 1968

Recipe

Whole Plant	6 ounces
Distilled Water	
Pre-chromed wool Pre-alumed wool	2 ounces

Simmer 1 hour
Color: golden-brown
Lightfast

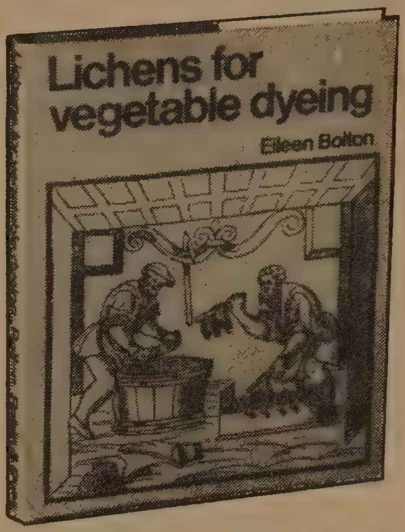
Page from a dye notebook showing pressed wild geranium, yarn sample, and recipe.

Lichens for Vegetable Dyeing

Your own subtle, aromatic "Harris" tweed! E. Bolton's small, excellent handbook on lichen dyeing is in print again, now expanded to aid the U.S. dyer. For identification you'll find the most thorough descriptions of many species, their habitats and growth patterns, and several pages of color drawings. Good collecting, extracting & dyeing instructions, too. Because many species grow very slowly, 50-100 years to produce a palm-sized patch, collect with care, and with use in mind.

— Diana Sloat
[Suggested by Suzanne Lainson]

Lichens for Vegetable Dyeing
Eileen Bolton
1972; 63pp.
$4.95 postpaid
from:
Robin & Russ Handweavers
533 North Adams Street
McMinnville, OR 97128
or Whole Earth



Lichens are more easily gathered in calm and still conditions following much rain. They almost vanish from sight in dry weather, and are easily broken and wasted when gathered in a brittle state.

If plants are being taken from a wall, it is best to work with the strongest light coming over one shoulder. Thin-bladed knives are most suitable for detaching those foliaceous plants which adhere very closely, but scrapers are best for the peat-like pads of *omphalodes* and for the rather mealy, crustaceous *tartarea*. Unless the plants are going to be used straight away, they should be very carefully dried in the sun and put into bags in a dry place. The crustaceous lichens should be dried and fermented straight away. There are so many little mites in the cracks and crevices, and they go on spoiling the plants. In any case it is a good idea to make use of the summer warmth for fermenting these plants, which are normally gathered in May and June, while the foliaceous ones are not collected until the end of the summer.

Making Stone Arrowheads & Scrapers

BY GIL VERDE

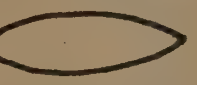
Arrow-points, spear-points, harpoon-heads, cutters, choppers (celts), scrapers and knives may be made of any rock which is sufficiently hard to chip (with a conchoidal fracture). Lots of authentic arrowheads and spear-points were made of inferior, grainy rocks like chert, but the American Indian preferred flint in the East and obsidian in the West, although a great deal of agate, especially the white, was used in such places as Utah. It must have been an early object of trade, because it turns up, especially in the form of cutters and scrapers, here in Texas (Presidio County) far from any supply I know of. Agatized wood was used also by the Indians, as well as anything else that came handy. Children did most of the preliminary striking of "fat chips" and they tried anything that looked promising. Even dense sandstone was used for scrapers when nothing better came to hand. The best place to look for suitable rock is in a dry wash or seasonal stream, where samples from a large area lie clean and ready for the first step in making an arrow- or spear-point. Making other cutters is simple. They are actually by-products of point-making.

Suppose one picks up a waterworn, dense rock, often adorned with tiny curlicues, which may be the prints of fossil shells in the matrix rock, flint occurring always below limestone, or in chalk, as in the White Cliffs of England. Indians mined some flint, as in the Alibate quarries near Amarillo, but mostly they sent the children to the riverbank, as at Lake Amistad, near Del Rio, Texas. There they picked up a likely rock about the size and shape of a beef kidney and struck the edge with the shortest curve a glancing blow, with any other handy rock. The modern maker does likewise, particularly if, as Angier suggests, he has managed to kill a deer and must snaggle a hole in the skin. After trying a few hammer-stones, he will find a hard one, flint probably, and use it thereafter.

The "fat chip" which are strikes off the large rock will be roughly the shape of a clam shell — hence conchoidal. Indians being both realists and lazy to boot, never carried large rocks any distance at all, and the children no doubt carried a pouch-full of fat chips home to the top of a hill where the sculptor himself sat, and then retreated hurriedly to escape the shower of inferior chips they had included. Sculpture of this sort must be the very first artform of the world, executed in the very hardest natural materials.

The maker of arrowheads must not be regarded as a specialist Outside a few artists who also made fancy pipe-bowls for the head-men, nobody was a specialist. Every man and most boys made arrow-points, after about the beginning of what Azimoo calls the Common Era, when the bow was either invented or brought in from the Old World. Before that, spear-points and dart-points for the short throwing spear, cast with the atlatl, were also made by everybody who had an interest in eating. There was small attention paid to bilateral symmetry, or artistic balance, except in a few special instances (cf. Folsom points, etc.). The point of an arrow or spear merely opens a hole for the shaft, which does the killing. Almost any shape could be used and almost any shaped point has been found somewhere. Notches for binding a point to an arrow are not seen on half the extant heads, because it was not desirable to hold the head to the more valuable shaft, once the bloody deed was done. The point was often stuck onto the business end of the shaft with asphalt or true-gum.

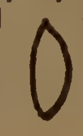
But, back to the maker, who has a small pile of shell-shaped chips beside him. A large one may need no chipping at all to make a cutter, and one can easily shave with fat chips made carefully from good rock. He takes a chip, sets on edge on his anvil-rock (any handy rock) and strikes it smartly with a hammer-stone. If he is lucky, he will produce one or more thin chips. If he strikes too hard, the resulting chips may display a fine variety of wave-forms, exactly like those seen on water when somebody agitates it somehow. Surely, flint is the hardest material one ever sees such a phenomenon in, but, had I the material, I believe I could make points of diamonds, emeralds, or other precious stones. Cabeza de Vaca reports getting five "emerald" arrowheads near Mazatlan in 1530 or thereabouts. Some of the semi-precious stones could have been used for "presentation points." Hardness is one thing, but conchoidal cleavage is another. All "glassy" rocks are possibilities. Glass itself can be used.

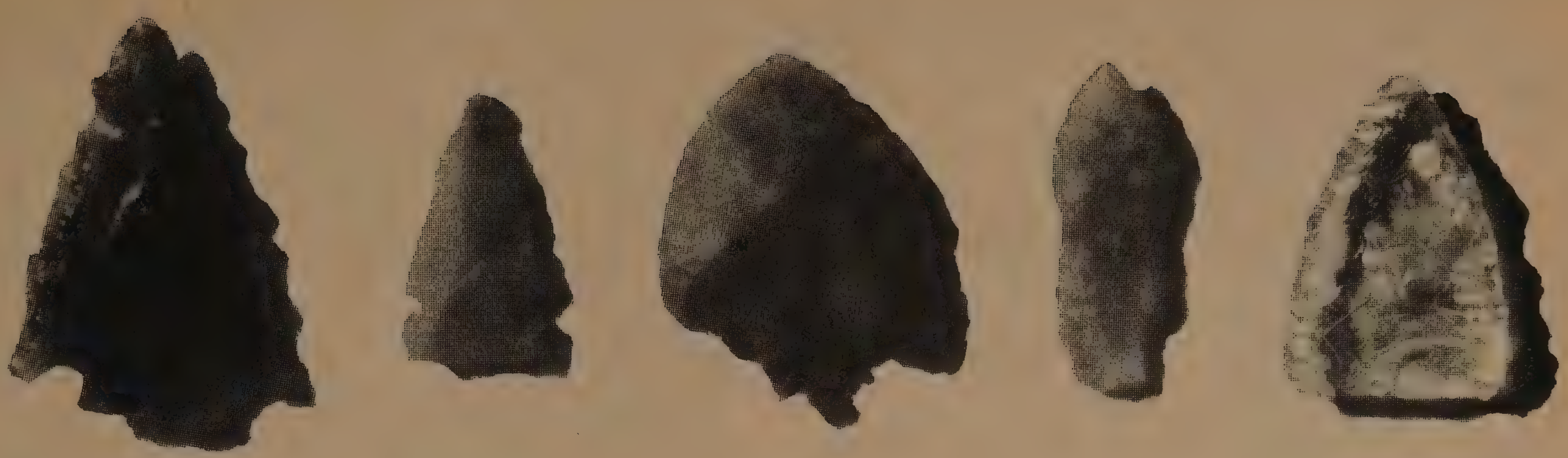
When one has his material reduced to thin chips, he may be using one ounce out of 100 pounds of raw material, and he is not yet done. Very carefully, using a light but hard hammer-stone, the artisan taps the edge of his proposed point, until it gets as close as he thinks necessary to a double-convex shape, maybe in the style of a leaf. Broken arrowheads, many broken in the making, usually show a cross section like this: 

Chips produced by this tapping may run half way across the point, giving rise to the belief that Indians used some secret method to produce them. I'm open to proof, but I know nobody today who can chip a point using fire and water. I have used a fine-flamed butane torch for a single needed chip. Try for two, and you'll have a broken point. A hot arrowhead and an icicle might work, but one should remember that arrowheads needed to be made every day. No Indian would be so forethoughty as to make a year's supply during a cold snap.

By the time the previously mentioned artisan has a handful of leaf-shaped proto-points, his original raw material will have gone over a ton, and the beginner today may find that a low figure. The Indian kids were at it every day, as can be seen on the shores of the Rio Grande, or on the lake and shores at Amistad. Hardly a piece of flint is to be found which has not already been struck, some millenia apart on the same piece, to judge by weathering.

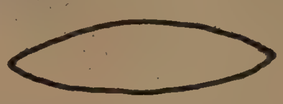
The finishing touches are soon described, and now for the first time does one need any kind of a tool, if one does not count the hammer-stones. I dare say many points were never finished at all, merely glued to a stick and used. But if one was a stickler for heads all of a size (and weight) he could reduce his blank heads further with a splinter of bone, or a tine off a rack of antlers. Since deer shed these prolifically, a modern man in search of survival tools need not wait to kill a deer.

But before going on, it should be noted that a heavy point (B.C. or war-spear) can be chipped very artistically by laying the roughed-in product on a stump or piece of wood and striking the edge with a light hammer-stone. This is not the same thing as described above, which consisted of tapping the vertically held (like this) 

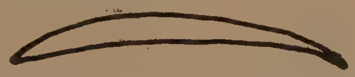


Some of Gil Verde's work, life size.

blank for the purpose of thinning it down. This time, one lays the head down like this:

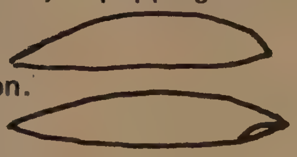


and taps off tiny shell-shaped chips for a very special reason. Most rough points, as the beginner will soon find out, are anything but straight, and while at arrow speeds it is unlikely that a head shaped like this

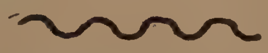


would develop any unwanted aerodynamic tendencies, it goes against the grain to stick a crooked head on a valuable shaft. Oddly enough, one can "straighten" a point made of the very hardest natural rock. This takes a little explaining. Regardless of how one does it, he raises the rock edge by knocking off, pressing off, or popping off a chip. Try it.

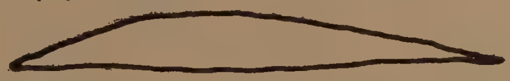
Here is the cross section.



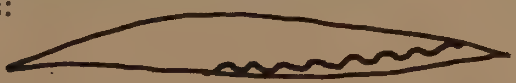
Push on the right edge and a chip comes off underneath. Presto. At that point you have raised the edge. One can preserve the edge and sharpen it by pressing off chips first down, then up (by turning the blank over). This produces the familiar side view of a point composed of a series of shell edges,



each pressed from the opposite side to the succeeding one. (An artist should be turned loose on the illustrations. I work only as a sculptor.) Now, if your point has survived all the preliminary steps, but has an unfortunate curve, like this:



you can, by sacrificing a little length, raise the right lower edge like this:



and you end up with something like this:

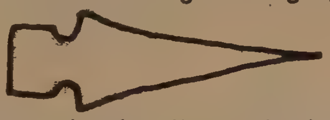
maybe a little heavy on one side, but as straight as straight can be on each edge.

This chipping I've been talking about is done easiest by laying the blank point on a piece of wood or cottonwood log and cushioning it, if you will, with a small piece of leather. One can hold the point down with his left hand, and push with the antler tine held like an awl, with the thick end in the palm. Quite large chips of even agate will flake off like tiny shells, and, with a little practice, one can shape a point to suit the most exacting arrowsmith.

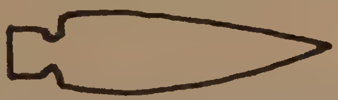
In the book about Paiutes Survival Arts, the author inquired about notches. How the Old People did it, replied the informant, he didn't know, but he used an ordinary 16-penny nail. If one must have notches, they can be put in with antler tines ground to fine tips on any coarse rock, or if one is a perfectionist, a javelina tooth or even a fine splinter of bone will do the trick. Merely press where you want the notches to appear, turning the point over again and again to keep the work symmetrical. The finer the point of the tool, the finer the notch.

Most beginners leave the notches and the base until last, and then they lose a lot of work, because notches and thinned-down bases account for much breakage. It must be remembered that the thinnest part of the point should be the base, since it has to be fixed in the cleft of a shaft not much larger than ¼". Experienced makers may actually put in the notches on either side of a properly thinned base before chipping out the point. It is a thing one decides after wasting some thousands of chips.

The shape of arrow-points seems to have been a matter of individual preference, although some experts think a whole tribe may have made the same general type of point. White men's points are usually too perfect, too symmetrical, too nicely notched, and convex along the edges, like this:



Many Indians, however, habitually made their points concave, like this:



To a primitive, it may have seemed that the latter style made the best hole. Maybe it did!

A word about those white men who want to finish their heads on a cushion of leather held in the left hand. It is more dangerous, it results in more broken heads, and it is tiring. But one thing is certain. With any hard, dense rock to be found in a stream-bed, one can fashion razor-sharp weapons and tools. All it takes is a little practice. Carry on. ■

P.S. As for the "glass" you mention in your note of January 13, there are very few authentic points of artificial glass extant, although Newcomb mentions that the Karankawas utilized green bottle glass, **Indians of Texas,** p. 61. Artificial glass is not quite as good for arrowheads as obsidian, the natural glass, which comes in many different colors including almost clear. The processes of manufacture introduce strains into bottle glass, which cause it to chip erratically. However, since your name is Sharp *[Andrea Sharp]*, I tried to fill the bill with a fragment of old glass I found on the ranchito. So you see it can be done. You may keep it as a conversation piece, to be used on know-it-all ethnologists. ■

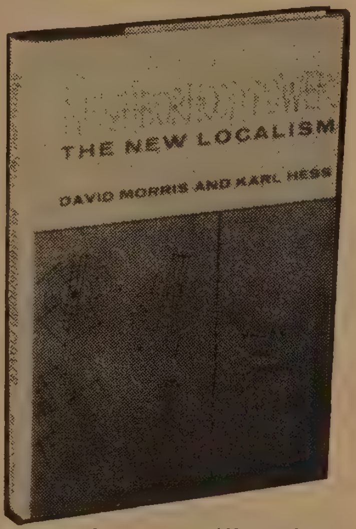
— Gil Verde
Redford, Texas

Neighborhood Power

"Let the local people speak," was one of the organizing principles we used when I was a SNCC worker in Mississippi in the early Sixties. It was an easy slogan to remember, and a good sorting device to use on the various lines of strange politics that came down at the meetings we held night after night all over the state. When one of us white liberal guilt freaks would get a little overboard on the cosmic revolution side, someone would whisper "Let the local people speak," and the meeting would get down to the business of building local power in a particular community.

This book is a manual toward local vocalism, toward getting back to the basics, toward putting humans back into the power structure. It deals more extensively with local economics than with local government, with what seems to be an assumption that local sufficiency breeds local politics, that power is based in the stomach, not the head.

— J.D. Smith



Neighborhood Power
(The New Localism)
David Morris and Karl Hess
1975; 180pp.
$3.45 postpaid
from:
Beacon Press
25 Beacon Street
Boston, MA 02108
or Whole Earth

On the neighborhood level, in order to begin controlling the fiscal flows within the community there need to be a number of different levels of education and institution building. First, there might be actual research studies which show how much aggregate income there is in any given neighborhood, how much is devoted to such things as gambling, crimes, fees, taxes, food, and so forth. This can educate the neighborhood into an awareness of its own resources and can also begin to give an overall picture of the "underdeveloped nation." Second, mechanisms could be developed to teach people how they can begin to redefine taxation and credit, and control at least to a minor extent the money they earn. This means the development of, for example, community sustaining funds, internal taxation mechanisms to service the neighborhood itself, and credit unions to capture a part of the savings in the area. The third step might be the establishment of a full-service bank, a neighborhood-development bank, which can fully involve itself with loans, savings, checking, and a number of other services for the community. Each of these steps has already been taken in different parts of the country, so there is some practical experience in the limitations and potential of each.

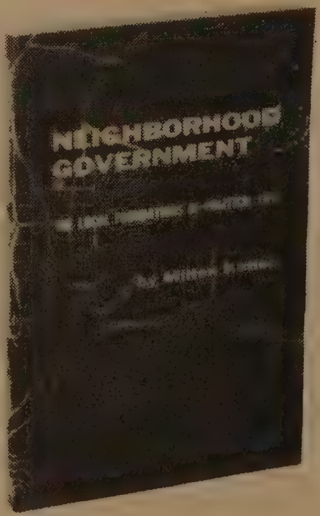
•

One way of starting to survey a neighborhood's resources is to begin with its human wealth, by going house-to-house, knocking on doors, getting to know the neighbors, finding out what skills they have, what tools or special equipment they possess, what facilities they have access to, what knowledge they possess. In one block in Washington, D.C., such a survey uncovered plumbers, electricians, engineers, amateur gardeners, lawyers, and teachers. In addition, a vast number of tools were discovered; complete workshops, incomplete machine-tool shops, and extended family relationships which added to the neighborhood's inventory — an uncle in the hardware business, an aunt in the cosmetics industry, a brother teaching biology downtown. The organizing of a directory of human resources can be an organizing tool itself. Possibly, if it is an outgrowth of a community hardware store, it can include a survey of broken items in the neighborhood. What services do people need most? What are the problems with most appliances? Are people willing to give a certain amount of money each year ($10, $20?) in order to have a group maintenance plan, with neighbors fixing appliances and gadgets and giving advice on redesigning houses for capturing more heat in the winter and cold air in the summer.

Neighborhood Government

Community Development is an uphill thousand-to-one-odds effort. It's where you see everything in city-life that is usually forgotten or pushed aside, but even seeing that much may be very difficult and require confrontation with City Hall, downtown interests, and token neighborhood organizations that want to reap the rewards for stilling genuine community voice. The scale and vocabulary of the problem are the first step. Milton Kotler's Neighborhood Government *is an excellent primer and stimulant to accurate applicable thinking.*

— San Francisco Zen Center and
The Neighborhood Foundation



Neighborhood Government: The Local Foundations of Political Life
Milton Kotler
1969; 105pp.
$2.95 postpaid
from:
The Bobbs-Merrill Co., Inc.
4300 W. 62nd Street
Indianapolis, IN 46268
or Whole Earth

What we require is a definition of the neighborhood and knowledge of its peculiar properties that are not shared by other units. This chapter proposes its essential definition as a political settlement of small territory and familiar association, whose absolute property is its capacity for deliberative democracy.

•

Both to advance local liberty and to defeat outside aggression, alliance with other neighborhoods and organizations is a major concern for neighborhood corporations.

•

Even those who proclaim themselves sympathetic to "neighborhood power" think of neighborhood corporation as little more than an administrative mechanism for carrying out centrally devised programs — the enduring mark of liberal reform.

•

In the final analysis, the most salutary fact in favor of new governments for our cities is that they are too vast to be dominated and must have their own sovereignty. And the basis of that sovereignty must be the federation of its local territories, the neighborhoods.

Briarpatch Review

A salutory trend is under way, I see, visible in the previous page on neighborhood government and on p. 70 in community gardens. Local territory, local politics, local economics — it's the real thing. Power that means & freedom that feels. Working friendship.

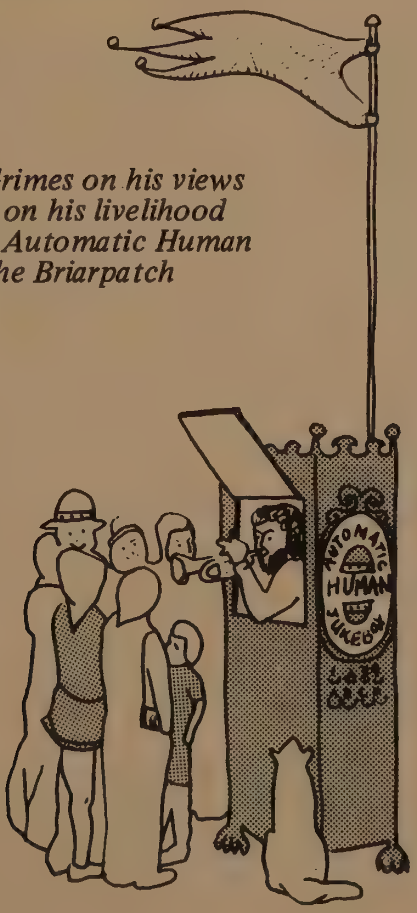
The Briarpatch Review, *a child of Portola Institute and* **The Seven Laws of Money** *(EPILOG p. 616), deals warmly and directly with local economics. The root of that word originally meant "home", and can again.*

— SB

Briarpatch Review
$5.00/yr, $1.00 per issue
from:
Briarpatch Review
330 Ellis Street
San Francisco, CA 94102

AUTOMATIC

A portable job where you can go to work stoned, work where you want, and set your own hours. All you need is an Automatic Human Jukebox like the one operated in New York, San Francisco and Europe by Grimes Poznikov. Grimes has been doing this for 3 years and earns between $3 and $6 an hour. So far he doesn't know anyone else doing it. The Jukebox is built out of cardboard Grimes found in a trash bin on 43rd and Broadway in New York City. The music is usually a trumpet, occasionally a kazoo, operated by "any amount" of money put in with a special 25¢ charge for photographers. According to Grimes, a 5 to 45 second raucous laughter follows most AHJ selections. He says there is little need for "uniformed officers" in the area of AHJ operation as "motivations (i.e., greed, anxiety, frustration) to commit serious crime are dispersed."



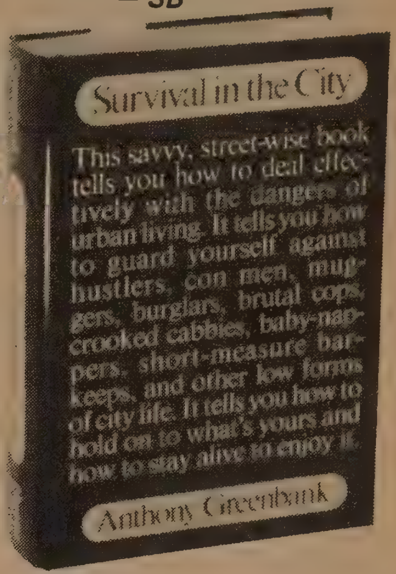
A three-page pamphlet by Grimes on his views of the world, with emphasis on his livelihood and how to make your own Automatic Human Jukebox is available from The Briarpatch Review for 50¢.

Survival in the City

If you liked Anthony Greenbank's The Book of Survival *(CATALOG p. 274), you'll like his new book, full of possible urban adventures such as burglars, poverty, crowds, terrorism, & con men. I find these books grotesque, fascinating, delightful. The advice is highly original, much of it like something out of Castaneda's Don Juan, and it may well work.*

— SB

Survival in the City
Anthony Greenbank
1974; 474pp.
$6.95 postpaid
from:
Harper & Row General Books
Keystone Industrial Park
Scranton, PA 18512
or Whole Earth


Survival in the City
This savvy, street-wise book tells you how to deal effectively with the dangers of urban living. It tells you how to guard yourself against hustlers, con men, muggers, burglars, brutal cops, crooked cabbies, baby-nappers, short-measure barkeeps, and other low forms of city life. It tells you how to hold on to what's yours and how to stay alive to enjoy it.
Anthony Greenbank

GET HELP FAST

The ways to shout for help most effectively are:

Call quickly as soon as trouble hits you.

Call as loudly as possible, because you have to compete with aircraft sounds, buses revving, trains shunting, trolleys rolling, public address systems squawking.

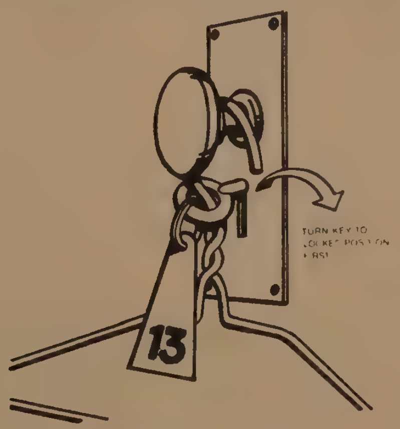
Call continually; keep up the shouts, cries, yells, screams for HELP or POLICE. Or even, when the terminal is deserted, FIRE — the one call which will fetch people running quicker than anything else.

If you are a woman in good health an ear-splitting scream will work. A chain of such shrieks will bring help running, and also has the effect of an "offensive" grenade on your assailant's system — it attacks him and defends you.

When you suffer from laryngitis, inhibitions about screaming in public; or simply a weak voice, call for help in a low tone. This does not carry as far as a scream, but the low-register call will last longer. It can be heard after a shriek has died away. Keep calling for aid in these low foghorn tones.

Bray, bellow and bawl in the gruffest, deepest and loudest tones you can muster. It helps to shout all the louder if you place the ends of both forefingers against your ears. The noise then cannot deafen you or dampen your yell through any inhibitions. You cannot hear yourself, but everyone else can.

The low-register call then becomes a long drawn out "HEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEEELP!" as opposed to a quick yelp or succession of yelps.


TURN KEY TO LOCKED POSITION FIRST
13

WARNING: Never leave a key on the inside of a lock to prevent others from using a passkey as you sleep without this coathanger safeguard. There are simple instruments which can be pushed through and used to turn the key from the outside — or the key can be pushed out of the lock so that it falls onto a sheet of paper that has been slipped under the door and is now pulled back with the key on it.

The Sports Book Catalog

There is a sports Renaissance going on that has nothing to do with Sports Illustrated *(spectatorship) and everything to do with* The Sports Book Catalog *(doing, diversity, & new sports). From the same people who do the excellent* Runner's World *($7/yr — monthly — same address), and* Bike World *($7),* Aquatic World *($3.50),* Nordic World *($4),* Soccer World *($3.50),* Down River *($4),* Self Defense World *($4), and* Gymnastics World *($4), this book of titles, synopses, and access will be followed soon by* The Complete SportSource Directory *(2,000 titles — $4.95). I would hope that it will be somewhat more detailed and comparative in its evaluations than* The Sports Book Catalog *(we could do better on that score too).*

Access to technique.

—SB
[suggested by Daniel Phillips]

The Sports Book Catalog
45pp.
$1.00
from:
The Sports Book Catalog
World Publications
P.O. Box 366
Mountain View, CA 94040

VOLLEYBALL

[VL-002] Point, Game, and Match! Val Keller. The US National men's and women's coach reveals a complete system of individual and team skills and strategies to develop volleyball champions. A serious guide to developing winning volleyball play. 1968 Ppb. 104 pp., ill., $3.95.

[VL-003] Volleyball, Wilbur Peck. An illustrated book to help the beginner learn the basic skills he needs to play and enjoy the game. All the do's and don'ts, plus chapters on officiating, beach play, history, rules, and a glossary are included. 1970 Ppb., 128 pp., ill., $2.95.

[VL-004] Volleyball, Egstrom & Schaafsma. The skills presented in this book are considered fundamental to effective play. Stragety and play patterns are represented in clear, concise language—a guide appropriate for any novice player who wishes to improve his level of play. 1972 Ppb., 58., ill., $2.50.

[VL-005] Power Volleyball for Girls and Women, Janet Thigpen. A presentation of this popular sport specifically for the female athlete. Includes a brief history, analysis of technique and skills, coaching suggestions, drills for training and court strategy. 1973 Ppb., 144 pp., ill., $4.95.

[VL-007] Volleyball, Allen E. Scates, and Jane Ward. A brief analysis of the increasingly standdardized basic skills. Beginners profit from the basics of passing, spiking and blocking, and advanced players will find dozens of finer points to improve their games. 1969 Ppb., 88 pp., $1.75.

[VL-008] Winning Volleyball: Fundamentals, Tactics and Strategy, Allen E. Scates. Written by the 1972 Olympic coach, this book describes everything on how to take beginners and turn them into sequences to discuss tactics, teamwork, and organization. A valuable source book. 1972 Hb., 264 pp., ill., $12.53.

How to raise rents

[Reprinted without permission from the Tenants' Newsletter, *San Francisco, who reprinted without permission (and with slight shortening) from the* Sonoma County Landlord. *Sent by Renée des Tombe.]*

YOUR RESIDENTS EXPECT RENT INCREASES — DON'T DISAPPOINT THEM

It takes optimism and courage to raise rents. But if an owner doesn't have those, he wouldn't be in this business. It takes a "damn the torpedos — full speed ahead" philosophy.

$5-$10 rent increases ain't going to cut it!

On supply/demand pricing, commence rent increases when occupancy reaches 85-92%. Always increase rents when occupancy reaches 95%. (Note: Occupancy rates in San Francisco vary between 97.5 and 99%!)

RAISE RENTS FOR CHRISTMAS

The best time to raise rents by far is November or the beginning of December — people do not move before Christmas. The worst time to raise is May-July.

Make certain your complex is spruced up at the time the rent notices are given. Cut the lawn, touch up the exterior, add something inexpensive but elegant that stands out (new mirror in the lobby, a gazebo or flowers in the courtyard, etc.)

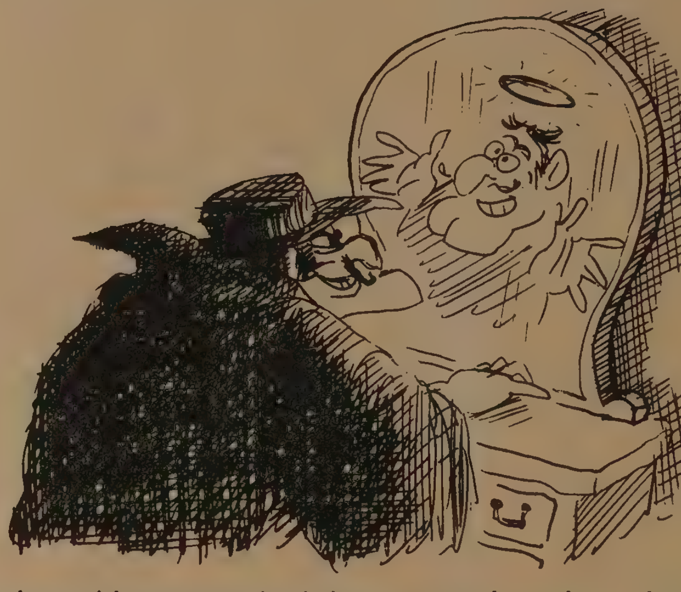
Communicate with the residents. Give them an explanation letter with the rent increase notice. Include copies of newspaper articles, etc., on increasing cost.

Raise rents more on unfurnished units than on furnished units. It is, of course, much harder to move a household of furniture.

You do not need to get a resident's written approval of a rent change. A short notice saying "On . . . your rent will increase to $ . . . All other terms of your lease remain in effect." As soon as the resident pays the new amount, the existing lease has been reaffirmed and is legally operative at the new rate.

(Note: **Tenants' Newsletter** underlining. If you have a lease, the landlord cannot legally increase your rent without your approval — don't pay it.)

Residents will want to sign new one year or more leases to protect themselves against further increases. Don't do it.



Tell them things are so bad that you can't project what's ahead — that the present increase is only allowing you to do some catching up — and that you are concerned about further inflation, major tax and utility increases ahead, etc. If you have to sign a new one year lease, specify an additional $5.00 or $10.00 rent increase after six months.

Make a deal to wallpaper a wall, paint a room or shampoo a carpet if you must to keep someone happy. Don't agree to recarpet without a further $10-$15 monthly increase.

If a resident moves out due to an increase, talk to the manager or management where he's moving. If they haven't experienced a major rent raise, they don't know what they're doing. Talk to them — show them cost figures and newspaper articles. Ask other owners to call them.

PLEAD POVERTY

Educate your managers of the absolute necessity of the increases. Tell them you're going broke. Plead poverty or low to negative operating margins.

Close the office for a day after distributing blanket rent increase notices. Residents stop fussing after they have calmed down.

Blame the utility companies — everybody does. Or blame Washington. It so happens that both are in fact guilty parties.

75% of residents who say they are moving due to an increase do not move. So play it cool. Take a firm stand.

Starting Line Sports

An equipment catalog of jogging shoes, timer's watches, hiking gear, soccer & wrestling shoes. From the amateur sports capitol — Mountain View.

—SB

- **PUMA 114 ALL-AROUND** A well-made shoe with an amazing sole that makes it suitable for running, tennis, basketball, gym, almost anything. It has sturdy white leather uppers and is available with either a red or a blue "Puma Stripe." Sizes: 6-13. PU04 — Wt. 2¼ lbs. $19.95

- **M-F HEEL PROTECTORS** — Protect against bruises, spurs, shin splints, blisters, callouses. One size fits all. MF01 — Wt. ¼ lb. $2.00/pair

$74.95

Starting Line Sports
(Specialty Sports Catalog)
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from:
Starting Line Sports
P.O. Box 8
Mountain View, CA 94040

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—SB

Catalog
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2466 Shattuck Avenue
Berkeley, CA 94704

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One of the few effective checks on corporate mischief is the Council on Economic Priorities. We're glad to print their ad.

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COUNCIL ON ECONOMIC PRIORITIES
84 Fifth Avenue, New York City 10011
250 Columbus Avenue, San Francisco 94133

Fast Speaking Woman

Like an anthem, like a million cheerleaders, Anne Waldman's chant fills the heart-sky. In her voice women's liberation is complete — completely done with freedom from — completely here in freedom to. I had forgotten. "Freedom" means overflowing.

— SB

Fast Speaking Woman
(& other chants)
Anne Waldman
1975; 76pp.
$2.00 postpaid
from:
City Lights Books
1562 Grant Avenue
San Francisco, CA 94133
or Whole Earth

I'm a singing woman
I'm a sleeping woman
I'm a muscle woman
I'm a music woman
I'm a mystic woman
I'm a cactus woman
it's not strange
no, it's not a lie
I'm the diaphanous woman
I'm the diamond light woman
I'm the adamant woman
I'm the headstrong woman
I'm the tunnel woman
I'm the terrible woman
I'm the tree woman
I'm the trembling woman
I'm the treacherous woman
I'm the touchy woman
    flowers that clean
    water that cleans
    flowers that clean as I go
I'm an impatient woman
I've got the right of way
I'm the baby woman, I'll cry
I'm the wireless woman
I'm the nervous woman
I'm the wired woman
I'm the imperious woman
I'm the purple sky woman

I'M THE PURPLE LIGHT WOMAN
I'M THE SPECKLED LIGHT WOMAN
I'M THE SUGAR LIGHT WOMAN
I'm the breathless woman
I'm the hurried woman
I'm the girl with the unquenchable thirst
    flowers that clean as I go
    water that cleans
    flowers that clean as I go

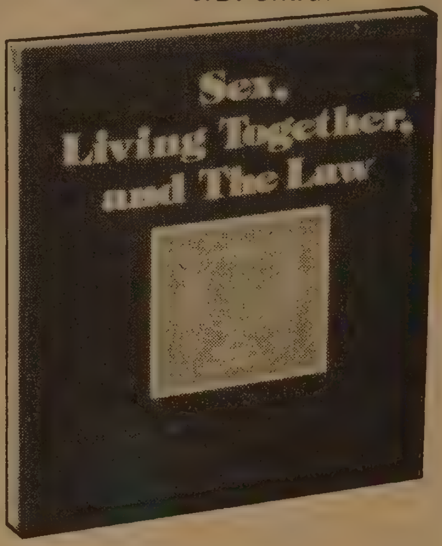
Sex, Living Together, and The Law

I have been legally married, have done my own legal divorce, have been common law married, and am participating in a common law divorce. My daughter was born out of bureaucratic, regulatory wedlock, which, to all you oldline assholes, makes her a bastard. I am glad this book has come along, because, like the mouse chasing the elephant, it means that some attention is being paid by someone in the legal profession to the rights of us folks who can't muster up enough confidence in any government to sign papers concerning our own damn business.

As well as setting out suggestions for do-it-yourself forms for many kinds of agreements between folks living together, this book breaks the legal terminology down into its human form at the heads of chapters, so there is a step-by-step understanding system at work which leads me, for one, to trust what the lawyer-authors were telling me. Should be real helpful to anyone who wants to live right out in the open with a partner without paper vows or wedding dresses. If your eyes are getting a little pink around the edges because you have been in the closet too long, try this book and get acquainted with your rights as a cohabitor.

— J.D. Smith

Sex, Living Together, and The Law
(a legal guide for unmarried couples [and groups])
Carmen Massey and
Ralph Warner
1974; 184pp.
$4.95 postpaid
from:
Nolo Press
Box 544
Occidental, CA 95465
or Whole Earth



We suggest written agreements for major purchases . . . . The purpose of the agreement is not to have something to show an attorney so he can fight for you, but to prevent this kind of action.

•

AGREEMENT

Josephine Adams and Joseph Benner agree as follows:

1. That both parties desire to construct a 30-foot sailboat following plans to be jointly agreed upon, to be jointly owned upon completion.

2. That each party will contribute $5,000 for the purchase of necessary supplies.

3. That each person will work diligently on the boat (this means at least 20 hours per month).

4. Should the parties separate, Josephine shall have the opportunity to buy out Joseph's share for an amount of money equal to Joseph's actual cash investment plus $5 per hour for each hour he was worked on the boat.

5. At separation, should Josephine decide not to buy Joseph's share under the terms of the previous paragraph, Joseph shall have the opportunity to buy her share on the same terms.

6. Should neither Joseph nor Josephine elect to purchase the other's share of the boat at separation, the boat shall be sold and the proceeds divided equally between the two parties.

7. If either party fails to put in 20 hours of work per month for three consecutive months on the boat, the other may buy out his (her) share under the terms set down in paragraph 4.

8. Should one party to this agreement die, the other becomes sole owner of the boat. If either party makes a will, this provision will be incorporated in said will.

Dated ____________ ____________
Joseph Benner

Dated ____________ ____________
Josephine Adams

> Love is an ideal thing, marriage a real thing; a confusion of the real with the ideal never goes unpunished.
>
> *— Goethe*

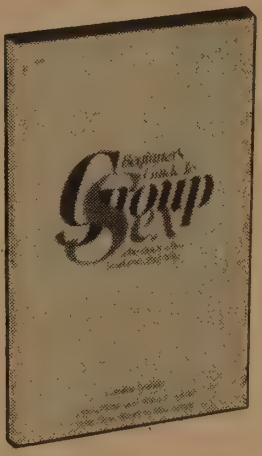
Beginner's Guide to Group Sex

Here's something for your erotics section. It's an introduction to swinging — among other things. It defines those terms one sees in personal ads: "B/D", e.g., has nothing to do with B.O. or body discharge or bald or drunk — it stands for Bondage/Discipline. Bondage is being tied up (or down) (or otherwise restrained?) & discipline is spanking, whipping & other dominance-submission acts. "Professional" does not mean the person is a geisha (as I formerly guessed). It merely means professional in the common sense — doctor, lawyer, etc. I never saw the term before and would never have guessed correctly what a "woodie" is: 'one who prefers sex outdoors, preferably in a rustic setting.'

The book gives some mail order addresses. Among them: Feathers, P.O. Box 45248, Chicago, IL 60645 — for things like French ticklers (are they worn on the head of the penis or at the base?); & Jerry Lee, P.O. Box 664, Garden Grove, CA 92642 — for Rin No Tama Duo-Vibra Balls, $15.95. (Also called Ben-Was, these are a Japanese invention, for ladies.)

—ALA
Berkeley, CA

Beginner's Guide to Group Sex
(Who Does What to Whom and How)
Caroline Gordon
1973; 157pp.
$1.50 postpaid
from:
Pocket Books
Simon & Schuster, Inc.
One West 39th Street
New York, NY 10018
Attn: Order Dept.
or Whole Earth



Letter

my man was so beautiful he was 37 he was an african man soft smooth skin hair that you could die in tight emense legs throbing body that could make love to me like i never had before i was with him a short time a long time a long time ago he was a killer his knife was so sharp so charged with pure essence that when he cut through it was a relief it was a long time ago he has a new life now im glad for him if its right if hes found a good black woman i pray to the fathers his family is safe anyway it was a long time i called him after 1 year 2 years i dont know i called him he hadnt moved or changed his address he said he knew sooner or later i would need him he thought he was my stud he thought i needed a good fuck that wasnt it at all he came through the war i did need him i was in the war too i needed him i was i am a proud lady i won the last round very calmly across miles and miles of telephone wire i sunk it in so hard and slow and i wasnt there for kill i told him i loved a woman and that i was going to live with her i never did live with no woman that way any way and he spat it out bitch if you were here right now id kill you and he would have hes moved now changed his number and i need him so actually i didnt win nothing at all but what i want to say really to my black brothers and sisters is this i have been working in enemy territory where you couldnt get in ive been paveing roads for your children you might thought i was a deserter i wasnt two men died on tv we saw it how manny died are dieing right now will die this summer i dont know sisters and brothers i dont want your men to die for me ive been working so hard against that ive been praying and screaming beating drums what good does it do our fine young men are dieing they are being set up pawns in the games ive seen it this summer im going to the fields ive seen the trap laied for another and im gonna be there if you didnt understand its ok im not taking your men from you ive burnt my chart my life has no importance now personal history has been eraced

nancie joy shaw
santa cruz, california

IX. *Thou shalt never say "I love you."* Swingers neither seek nor desire emotional involvement. With them, it's simply sex for sex's sake. Even an occasional "I care for you" is out of line. On the other hand, complimenting some physical characteristic or sexual technique is certainly permissible, such as: "You really turn me one!" or "You have a terrific body!" or "I like the way you're built!"

X. *Thou shalt remember there is a time and a place for everything.* This rule is true in Swinging as it is in so many other of life's endeavors. Generally, the *time* to Swing is set by the host couple. They initiate the activity and get the ball rolling, so to speak. After that, everyone is generally on their own. The *place* to Swing is usually a bedroom or den or some other room designated for that purpose. It is not the living room or family room or other central gathering place where the party itself is in progress. This place is generally reserved as a sort of "neutral territory" that everybody returns to between Swing Sessions. It is here that guests can relax, sit, talk, drink, smoke, dance, or begin their next seductive encounter. Then it's back to the old bedroom again — and again — and again — .

BE CAREFUL WHAT YOU LONG FOR, YOU MIGHT GET IT

by Judith Goodman

Lady Pearl's in heat, I can tell
By the way she wiggles her ass,
And smells so ripe
And talks so much,

I recognize the space
Intimately.

Now here's the rub.
No one to rub, that is to say
On all the ridge there's not a male
Of the appropriate species.
So what's a girl to do?

She yearns, and she calls, and she purrs
And she grovels and she hunts and
Continues to smell delicious.
And the strength of her desire is such,
That
Here he comes, in person.
Mr. Macho Bobcat
Himself.

Tufts of hair in his ears,
An insolent swagger to his walk,

Unhurried, confident, muscled, lean
And very mean of eye.
A most essential male.

How does my Lady Pearl?
Oh, very coy.
Scared shitless, to be exact.
Cowering under the house all night
Trying not to smell enticing.
"Please don't rip me from guzzle to
Snatch."

The point of this disaster is, to wit:
Be careful what you long for,
You might
Get it.

Reprinted from *Waldo Point Garlic Press*, Sausalito, California

Birth Without Violence

[The reviewer is Raven Lang, author of The Birth Book, *EPILOG p. 612.]*

This is a book written by Frederick Leboyer, a European physician who is said to have delivered over 10,000 babies. He has developed a sensitivity, a point of view, and an art in the birthing of human life. That is what his book is about.

For me the most meaningful aspect of this book is in Leboyer's attitude toward the experience of birth from the perspective of the newborn. Most other birth books deal with the experience of birth from a position concerned primarily with the mother, secondarily the father, or medically written for the physician or midwife. I know of no other book which has the infant's point of view and well being as the primary concern.

Leboyer perceives birth to be a traumatic event for the infant. He wants to minimize this. And so he sets a stage for birth, creating an atmosphere of silence, slowness, darkness, and reverence. He feels birth is sacred, and so he behaves accordingly. Labor progresses without hurry-up pressures on the mother. Time sets its own pace which is accepted with love and without fear.

> *. . . silence . . .*
> *darkness and quiet; what more is needed;*
> *Patience. Or more accurately, the learning of an extreme slowness that comes close to immobility. Without acceptance of this slowness, success is impossible;*
> *without it, we cannot truly communicate with an infant.*

When the baby is born it is placed face down on its mother's stomach. Skin to skin contact and some undisturbed moments are the newborn's first experiences. In today's hospitals the usual first experience is to be held upside down dangling by the feet and suctioned with a bulb syringe in the nose and throat. Leboyer believes these procedures are not only unnecessary but cruel as the first extra-uterine gestures. Many others are also questioning these acts for the same reasons. And it is a matter well worth questioning if it seems to be so unnecessary as to not warrant its practice for the normally delivered infant.

Leboyer does not immediately clamp and cut the umbilical cord. Instead, he acknowledges and respects the continuance of a functioning life line between baby and mother which allows the mother to continue supplying oxygen to the baby in these critical moments. And this, says Leboyer, may be a few minutes.

> *We must behave with the most enormous respect*
> *toward this instant of birth, this fragile moment.*
> *The baby is between two worlds. On a threshold.*
> *Hesitating.*
> *Do not hurry. Do not press. Allow this child to enter.*
> *What an extraordinary thing; this little creature, no longer a fetus, not yet a newborn baby.*
> *This little creature is no longer inside his mother, yet she's still breathing for them both.*
> *An elusive, ephemeral moment.*
> *Leave this child. Alone.*

In a few minutes nature completes these tasks and the baby becomes an independent being. Now the baby is born. And this is a time that one can speak or communicate to the baby. Leboyer believes this is done through the hands. "Touching is the primary language." He begins a massage on the baby's back, attempting to reconstruct some of the prenatal rhythms that occurred during early pregnancy when the uterus was large and the fetus moved freely and joyously. He reconstructs these rhythms of peristaltic waves through his hands. Leboyer asks,

> *What would our hands say?*

and he answers,

> *Exactly what the mother and her womb have been saying.*

[more →]

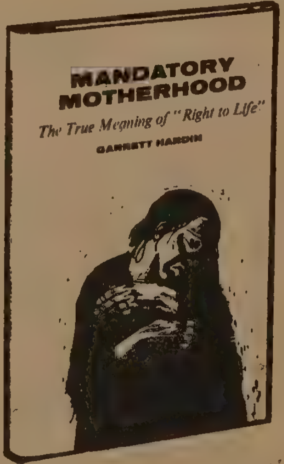
Mandatory Motherhood

The Supreme Court's decision on abortion is not inviolable, viz. the Edelin case in Boston. So here comes good ol' Garrett Hardin to do yeoman service as a polemicist for the right to abortion. Mandatory Motherhood *is wittily brief; it provides a good bunch of arguments against the Right-to-Life position, among them a classic Swedish study of unwanted children born to mothers denied abortions.*

Hardin warns that there are enough cranks working on this issue to succeed in turning back the clock. It's necessary to fight them, to counter sensationalism with clarity. Hardin is a past master.

— Stephanie Mills

Mandatory Motherhood
(The True Meaning of
"Right to Life")
Garrett Hardin
1974; 136pp.
$1.95 postpaid
from:
Beacon Press
25 Beacon Street
Boston, MA 02108
or Whole Earth



Among the Rif, as with many people, abortion is a very serious offense — officially. If a man is certain that his wife has had an abortion he'll beat hell out of her, and nobody will protest. Does this mean that there are no abortions among Rif women? On the contrary: the women have no difficulty whatever in escaping unwanted pregnancies. Here's the way they do it.

In addition to the general market day, once a week there is a special market day for women only. Men are forbidden to enter. On the women's market day a woman can buy cosmetics, love potions, contraceptives — and abortion services. The men know nothing about it — officially. Unofficially they no doubt have their suspicions. But it would be a foolish man who tried to penetrate the secrets of the women's marketplace. That's her world; his lies outside.

So, of what significance is it that the Rif forbid abortions? Really very little. Rif *men* forbid abortions; Rif women *have* them.

•

When does life begin?

The true answer is simple: *Never.*

That answer may not be satisfactory to disturbed legislators looking desperately for a way to manage abortions, but it is the only true answer. Life no doubt did begin once, many years ago. Archbishop Ussher, the Irishman who put the dates between the columns of the King James Version of Genesis, thought that the world — hence life — began in 4004 B.C. Darwinians think it began about three billion years ago. Began once only. *In our experience* life never begins. Life is just passed on from one cell to another.

Life ends — often.

Life begins — never. Not so far as we can see.

Yet he does not use the hands whose rhythms already have much communication with the child. He uses his own hands. He wants the hands that touch to be ever so sensitive.

> *Many mothers do not know how to touch their babies. Or, to be more exact, do not dare. They are paralyzed.*
> *Many will not admit it. Or are not even conscious of it. But it is true nevertheless, if you can recognize the signs.*
> *There is something that restrains these mothers. Some profound inhibition.*

After the massage the baby is then placed in a prepared bath gently and slowly, allowing the body to experience the weightless limitless movement which is so reminiscent of the womb in earlier pregnancy. Here, Leboyer says, the baby takes his first look. Then he begins to move his body, turn his head and stretch his limbs.

> *And not ten minutes have gone by since it was born.*

Then, when the baby is completely relaxed and there is not the slightest bit of resistance in his body, the baby is moved to the next stages of birth which include being clothed in warm garments which leave the hands and face free. Next he is left alone to experience solitude. Soon, Leboyer claims, someone will come and cradle the baby. By this time

> *. . . our newborn adventurer is free of fear. He or she has gone from change to change, from one discovery to the next, so slowly, so surrounded and enveloped in love and attention, that everything that happens is accepted with confidence and happiness. Nothing startles. At the very moment when other newborn babies are beginning to howl and sob more violently than ever, our baby remains silent.*

This is the birth ritual as performed by Frederick Leboyer. A ritual performed with utmost sensitivity and reverence. Beautiful photographs run through this book to demonstrate these techniques, and at the end of the book are two outstanding photos of an infant less than 24 hrs. old who is smiling blissfully and defying all texts which claim that newborns do not smile till they are several months old.

I agree much with Leboyer in his treatment and tenderness to this most delicate person. Where I differ from him is in the area of who performs these rituals to the baby. Who might be best to give the baby its first rub or massage? Whose eyes might be the best eyes for the baby to gaze into the first time he or she opens its eyes? Who might be the best person to give the baby its first bath and experience the exchange of love and trust in this ritual? To me it seems incorrect for Leboyer to attempt to reconstruct a prenatal rhythm familiar to this particular baby when the person who possesses these intrinsically individual rhythms is already there. I am speaking of the mother. And as these rhythms are already hers, so also are they already the baby's. In my own observations, when the mother is left totally in charge of the baby and the birth scene, she is massaging the baby almost immediately after birth. And as she rubs she too gazes. And she assesses — using all her senses through a heightened awareness. These touches and gazes seem to be mutually involving to both mother and infant. I believe these are critical moments to the formation of the incredible bond that occurs at birth. And the bonding should best be done with the immediate family. If for any reason the mother is unable to perform this rubbing act, then it seems the person next best would be the hands and rhythms of the father, which are also known to the infant.

As for the bath, I have never witnessed one, but again I feel it would be best for a more personally involved person to perform this ritual. It seems like a perfect time for father and child to exchange this experience, and I can only imagine that the experience would strengthen and enhance the bond that forms between them.

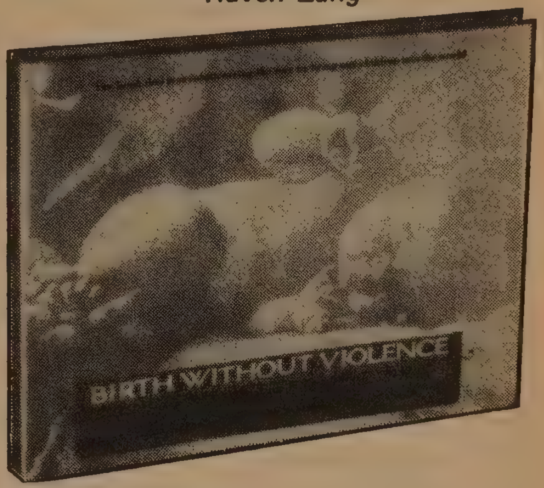
With the prepared mother and father whose love for their infant far outweighs their fear, I have extreme faith in their doing what is best.

Leboyer says, and I emphasize it again,

> *Leave this child. Alone.*

— Raven Lang

Birth Without Violence
Frederick Leboyer
1975; 115pp.
$7.95 postpaid
from:
Alfred A. Knopf, Inc.
457 Hahn Rd.
Westminster, MD 21157
or Whole Earth



Laparoscopy

Dear Co-Evolution —

Re: Winter Solstice issue: BIRTH CONTROL. Please stop putting down the IUD. I had a hassle-free one for 5 yrs. They are great if they work for you, certainly better psychologically & no worse physiologically than the pill. But . . . much unsung & little talked of is laparoscopy, a permanent solution, equivalent to a female vasectomy. It is an operation & time involved will vary according to your dr's. whim. Mine was done in Jan., a decision made after 2 conceptions, enough to fulfill any obligations. I entered hospital at 9 AM, was put under at 1 PM, came to at 2 PM and was home by 5 PM. Was fully functional next day tho forced myself to "take it easy." I sported 2 bandaids, one across my umbilicus, other just above the hairline.

What is involved is; Two incisions are made — one to admit a viewing device, the other to admit device to cut/cauterize approx. 1" of fallopian tube on each side. Incisions are all of approx. ½"-1" long, & placed inconspicuously (one is actually IN your bellybutton!). It is permanent, chances of reversal almost nil.

My recovery was quick — biggest hassle being the fact that the level of belts, waists on pants, etc. are almost the same as your bellybutton, which remains tender for a week or so. Sex is possible but I found standard position of laying one against the other was uncomfortable (especially if your lover is fairly heavy) but not insurmountable! Within 3 weeks I was swimming again (almost the only prohibition during healing). Now 2 mo. later I feel really great about it. No more worries of unwanted children, I feel more independent. My body is more MINE, I am less ITS. My periods are shorter, less copious, virtually 100% painless, and more tolerable, less hassle. I feel very good about the operation because it interfered so little with my daily life — had I heard of it sooner! All my vital parts remain intact & functional. The effect is not really so much different than the natural blockages which often occur in the fallopian tubes of women, preventing conception. Eggs are still there, still produced but can no longer get near the sperm. They are re-absorbed by your body.

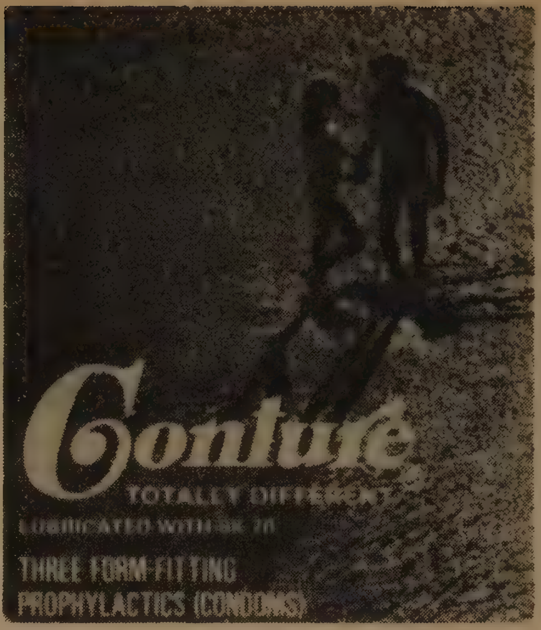
So . . . I wanted to pass this information on to other women who are realizing that the pill or IUD or anything else is not a permanent solution. This is, hence a decision of some gravity. But it's an option more people should know about.

Peace and plenty,

Andi Ray Bartnek-Lewis
Calgary, Alta., Canada

In the U.S. you can get referrals for laparoscopy tubal ligations from your local Planned Parenthood, public family planning clinic, or Association for Voluntary Sterilization, Inc., 708 Third Ave., New York, NY 10017. You will most likely be referred to a major medical center because relatively few doctors are trained to perform this procedure as yet. The cost (higher in the U.S. than in Canada — they have public health) should not be more than $500, which is 50% of what it used to be when a large incision and a stay in the hospital were de rigueur. Incidentally, vasectomies cost about $100.

— Diana Fairbanks



CONDOMS, These Days

BY SALLI RASBERRY
AND LAIRD SUTTON

After unhappy experiences with the birth control methods I was using I decided to stop and listen a little closer to what my body was trying to tell me. The pill caused me to have twenty four day periods. Too much day-to-day responsibility of remembering to feed myself another pill. Switching to the IUD my body protested strongly from the moment it was put in. Two tries it took to make it stick and then there was an almost constant nagging pain. Finally I had it taken out after encountering horror stories and alarming statistics. Sex is wonderful but when you don't want any more children the future of your sex life can look a little grim.

We decided to give condoms a try, no side effects, we both could take responsibility and it seemed a lot more fun than the other alternatives. At first we visited the local drug stores. There we found the rubbers of our youth labeled "For the prevention of disease only." The phrase "I won't take a shower with a hat on" seemed exactly right. Sigh. Our friends thought us weird — we were about to give up when I found an ad for mail order contraceptives. One week later we were eagerly opening our package of one hundred condoms.

What a trip. Red ones, green ones, dry ones, wet ones, ribbed ones, black ones. We blew them up, tried them on, tried them out, measured how long they were, how thick, filled them with water and made a barometer out of one. During my most fertile days we use a birth control creme which comes in a disposable applicator. It looks like a tampax. Nothing to clean and it's all premeasured. Conceptrol is one of the most potent of the spermicides. A little expensive though, $2.40 for six hits. Where I am now is feeling a new sense of freedom and elation at having my body back.

By being able to experiment with birth control we've found a new sense of liberation and at-touchness with our feelings. We feel that doctors and others who give out information and material for birth control should leave space for each individual to find out what's good for them personally. Here is some of what we found out.

DO THEY WORK?

Planned Parenthood says that when the condom is used by itself that it is theoretically 97% effective, but in actuality it's 80-85% effective. The difference seems to be in terms of lack of knowledge of how to use it to the best advantage. Use it with contraceptive foam or jelly and the theoretical effectiveness is 99% and actual effectiveness 95%. Hopefully a little education will go a long way. Not only is it a good birth control method it also radically cuts down on the spread of VD. If everyone in the US were to use rubbers for three months we could get a long way ahead of VD.

WHERE DO YOU GET THEM?

Drugstores, mail-aways, some family planning centers are the main sources at present. A recent bill has been passed in California to allow their sale in a variety of public places, but as yet they may not be dispensed from a vending machine. Availability is considerably greater in other countries. In Japan (where the Pill and IUD are not legally sanctioned) 70% of the couples who use contraception use the condom which Japanese women sell door to door. The variety in US drug stores make for slim pickings indeed. The mail-aways appear to be the best source at the present. The two mail-order catalogues we use are:

Adam and Eve, a division of
Population Planning
P. O. Box 2556 B
105 N. Columbia Street
Chapel Hill, NC 27514

Federal Pharmacel Laboratories
6652 N. Western Avenue
Chicago, IL 61645

Both are dependable and fast and offer a good selection of fresh (sometimes the date of manufacture is stamped on the condom) tested condoms. It's a good idea to order both and check the various prices which vary a good deal. We have come across nine different firms making condoms. They cost less than a cent to make, but packaging and middle people raise their price to $.08 to $.35 each, depending on quantity and type.

VARIETIES

Choosing a condom is a matter of personal preference. They all work. This is the way we make our decisions. There are two main types of condoms — skins and latex. We found the skins slip off easily, cost twice as much as latex and are not that much more sensitive. We prefer the latex.

There are a lot of different colors in latex. It adds a visual dimension which can be a real turn on. The opaque white ones look like an old rain coat. Some rubbers are dry and some are lubricated. The dry ones are harder to put on and in. There's nothing like a dry rubber in your cunt or feeling the skin of your cock pulled and pinched. Some are very wet and dry quickly. The best feeling ones are lubricated with a dry silicone, sometimes called S-K 70. They are silky and sexy. In addition we sometimes use saliva, K-Y Jelly or foam. The lubrication provides a thermal zone to effectively transmit feeling.

The "old fashioned" condom did not have a reservoir end to catch the semen, which contributed to leakage and breakage.

Most of the latex ones have a reservoir and we highly recommend these. Several of the condoms are contoured to cling to the head of the penis.

Latex condoms can be extremely sensitive and also very dull. When we miked them we found that the thickness ranged from .0015 in. to .0035 in. — which really made a difference in sensitivity. We hear it bandied about that rubbers are good because they dull sensation helping the man to last longer. Sensation is the name of the game. Why have a numb one when sex is so much fun? Men are not kept around as studs for female enjoyment. If you're coming too fast try learning to relax, especially your legs, thighs and small of your back or come again later. There's no need to put yourself down for coming or to buy a thick condom.

We have found several condoms of the fifty we encountered that incorporated all the best features plus good packaging:

> **Conture-Prime which come three to a package complete with instructions.**
>
> **Profil from Sweden which is packed ten to a pouch with instructions.**
>
> **Jade Sheaths which are green, twelve to a pouch with instructions and throw-away bags.**
>
> **Stimula which is our favorite from Sweden. It boasts a specially textured surface (although the ribbing is only .001 in. high, it's very exciting) which massages the sensitive vaginal tissues in the first third of the vaginal barrel where most of the feeling is.**

These range in price from about $.25 to $.29 each by the dozen to about $.13 by the gross.

HOW BIG?

They are all one size and are advertised to fit any size man. The average length of an erect cock is a little over 6 and one half inches. The condoms with reservoirs are almost all seven inches. A big "however," though, they appear to be made only for the uncircumcised male in length. The uncircumcised male has up to two extra inches of skin to account for. Uncircumcision discrimination?

STORAGE

Proper storage of a condom is important for their effectiveness as they are made primarily of latex rubber which if kept too long or too hot can ROT. Many are dated and these dates indicate a shelf life of four years. Planned Parenthood suggests a shelf life of two years which seems right to us. Keeping them in your billfold for very long is not a good idea. Often they rot or the foil package breaks and perforates the rubber. Keep one for show in your billfold if it makes you feel good but have a fresh one handy for use.

PUTTING IT ON

Do it before there is any penetration, even just for a moment. There is a pre-ejaculate fluid secreted by the cowpers gland which prepares the tubes for ejaculation. The pre-ejaculate often contains sperm, hundreds of them, and it only takes one to become pregnant. If you use a separate lubrication other than what is on the condom, stay away from vaseline. It will weaken the latex and irritate the vagina. Use foam or K-Y jelly.

Make it a fun thing to do. Either partner can put it on. Roll the condom over the head of the penis. Squeeze the end slightly to release the air (it increases sensitivity and helps to eliminate breakage) and unroll it slowly until the entire penis is covered.

Condoms are made for the erect penis so it's best removed while it's still at least semi-hard, otherwise it may slip off. As the rubber tends to cling to your skin pulling it off by the tip may spray your partner.

If you are concerned about the possibility of VD, wash your cock or cunt and surrounding area and urinate afterward.

CONDOMS AND VD

At this time condoms are the only form of birth control that also provides protection against veneral disease and trichomonas (vaginal infection that gets passed back and forth between partners and can be hell to get rid of). There is some indication that some foams may also help, but this is not well researched yet.

One in five June 1974 California High School graduates had already contracted VD. It is now epidemic among people between the ages of fifteen and twenty-four.

Doctors may legally treat persons of any age for VD without informing the parents or guardian.

VD clinics could give out condoms to those who come for VD treatment as it can still be passed even though treatment has been started. Studies indicate that once teenage boys are introduced to the condom they are likely to continue using them.

PREGNANT DROP-OUTS

Being pregnant is the single biggest reason for girls dropping out of high school. Many young women feel it couldn't happen to them, were careless, forgetful. Often boys seem to leave contraception up to the girl. There is a feeling that if you get caught there's always an abortion possible.

Women under 20 had 35% of all abortions and 44% of all illegitimate births in California in 1974.

If a young person took precaution the first time they had intercourse, 78% continued to do so. If they did not use protection the first time, only 49% got it together for the future. About one third of sexually active females under 20 use a reliable method of birth control, the most common method being the pill. Children want sex information from their parents. They want facts without arguments or need to reveal their sex lives. They often feel doctors and clinics to be patronizing and many feel that they could not afford or find birth control devices.

Under the California Schmidtz Act a teaching credential can be revoked if a teacher does not willingly inform the parent in writing or by phone the use of any word relating to sex such as penis used in their classroom.

The facts are alarming, the chasm between adult information and experience and the needs of youth is widening. Children have their own values yet lack the ability to see into the future. A groovie fuck tonight without precaution may be an unwanted child forever. As long as parents and other adults are uptight and judgmental of the young, communication will strangle and die. Our children are developing mature bodies at an early age. They are ripe and their biological urges to reproduce seem strong. Yet the brain is an important sex organ. Who is going to take the responsibility for actions that affect the whole of mankind? ■

BY **WILLIAM L. CASSIDY**

If you have been frustrated in your efforts at pet keeping by unsympathetic landlords and the horrors of an iron-clad lease, it is worthwhile to consider the homing, or carrier pigeon as a possible solution. Quite often, the landlord who takes a strong stand against cats, dogs, hamsters, and snakes, considers the keeping of birds as harmless and perfectly acceptable.

Homing pigeons have the advantage of being the only bird which may be released without danger of loss. For this reason, they make excellent, useful pets, as it is possible to regularly allow them their freedom secure in the knowledge that they will always return.

It is best to acquire a mated pair of young pigeons, and these should be kept in a loft no less than three feet by three feet by four feet in size. This loft may be constructed of any handy materials, and may be placed on the roof, or "built-in" to any always-open window.

Pigeons are fed on a mixture of grains, corn being a special favorite. In addition, they must be provided with clean, clear drinking water, and a shallow bath. Beyond water, grain, the loft, and some patience, little else is required.

The training of homing pigeons begins at eight weeks, and consists of merely hand-feeding them kernels of corn, petting them, and generally making friends. After the pigeons become accustomed to their loft — usually by the time they are four months old — they may be taken a block away from the loft and released. They will circle in the air for a few moments to get their bearings, and head directly back to the loft. It must be emphasized that pigeons should always be released on an empty stomach, and be fed only after they have returned.

At intervals of about three days, you may take your pigeons on small "jumps" or progressively longer distances away from the loft — taking care that these training sessions are conducted on only bright, clear, sunny days. Usually the practice is to take them on one mile "jumps" out to about ten miles, and then increase the "jumps" by increments of ten, twenty, and fifty as the bird becomes more reliable and experienced.

Bill Cassidy, who edits the **Knife Digest** *(EPILOG, p.666), wrote us, "Pigeons are my hobby — a hobby that was begun one month when the telephone bill passed $1,000.00. In total disgust, I turned to training carrier pigeons, sending them on errands with messages affixed to their legs. It didn't help the 'phone bill any, but I nevertheless learned to love the little critters ever since."*

I'm grateful to Cassidy for letting me know about Gerber hunting knives, the best commercial (non-custom) blades around.

— SB

As to the carrying of messages — this may be begun as early as you wish, even with the first flight. To regularly exchange messages with a friend, it is necessary to have two lofts: one at your friend's place, and one for yourself. You keep one of your friend's pigeons, and he keeps one of yours. The birds are released, and make straight to the "home" loft.

Perhaps the only drawback to pigeon keeping is the fact that once broken to a loft, the pigeons can never be transferred to another. Thus, if you move, your birds will have to be retired from service.

Homing pigeons are quite clean, personable, and friendly. There is also a certain undefinable joy that comes from releasing them for a morning or afternoon exercise, watching them revel in the skies, and then in a gesture of true trust and domestication, return straight to your hand.

If you are interested in pigeon keeping, I would be glad to send you all the needed information, plans, etc., free of cost.

William Cassidy

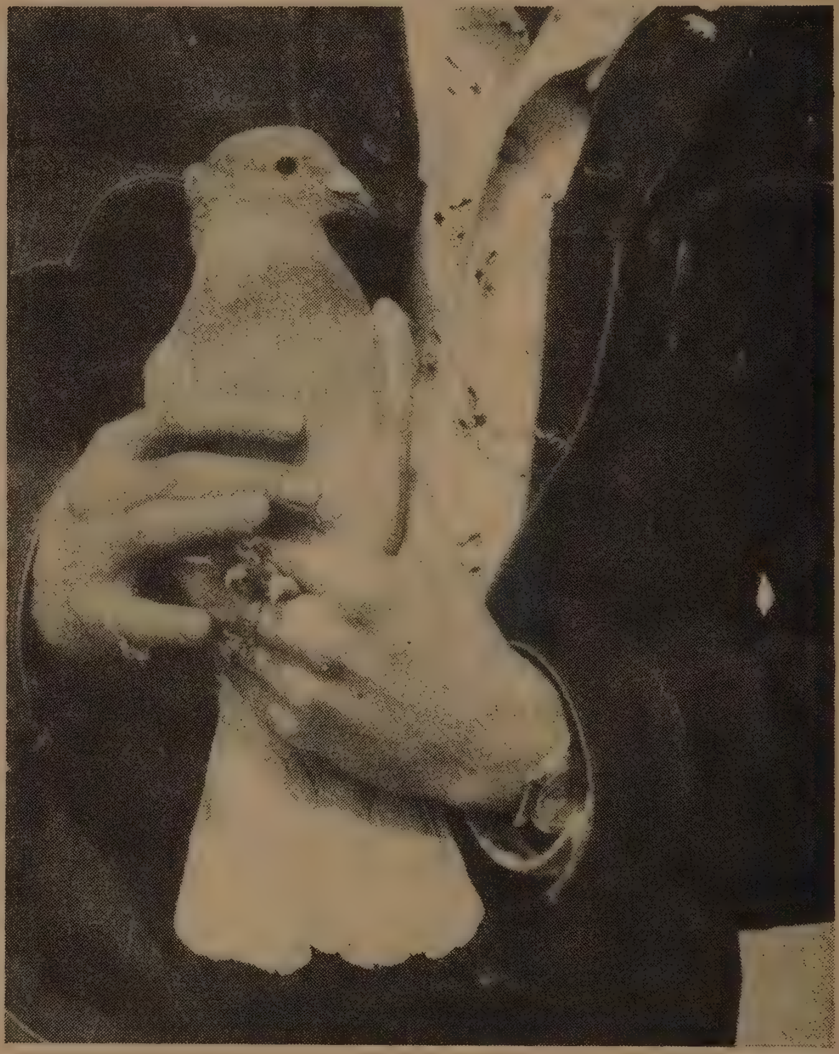


Photo #1

[We wrote him for more details & graphics. His reply:]

Dear Andrea,

Enclosed find two (2) proof sheets of pigeon photographs, which were taken by my friend Sgt. Al Jayne, of the Alameda Police Department.

They are, admittedly, less than satisfactory, but we were a bit hesitant to shake up the loft, as the ladies are still sitting on their eggs.

It takes about 18 weeks to hatch, and by my calculation that shouldn't be for a while yet, so I guess we will have to forego the miracle of pigeon birth, or whatever.

For your own information, Photo #1 illustrates the correct method of holding a pigeon. With your right hand you grasp them firmly about the wings, on the top of their body. You grasp both legs between the index and middle fingers of your left hand. The idea here is to prevent wing injury, should the pigeon resist.

Photo #3

Photo #7

Photo #2 is, perhaps, a better view. The model is my all-around stud pigeon, Sherlock, who was vile of temper during this session.

Photo #3 illustrates an important training exercise for young pigeons, prior to first flight. After you have fed them in the loft for several days, you take them out one-by-one and push them through the "trap." It is best to do this on an empty stomach, and it helps if the pigeon hasn't eaten either.

Pushing the pigeons through the trap teaches them to enter the loft unassisted. A smart pigeon only has to be pushed through about two to four times, over a period of about two to three days. An ignorant pigeon, such as Sherlock, has to be hustled through the bars about ten times, before the idea actually registers.

Photo #4 illustrates my own loft, which is on the roof of a three-story building. It was erected in half an hour, using junk lumber and liberated chain-link. The small "box" on the top of the loft is the trap. It is best to paint the trap some bright color (orange is good), so the pigeons will be able to pick it out from the air. This loft is, as you can see, rather small, but it will accommodate four to six pigeons in style.

Photo #5 is an extremely angry mother pigeon, puffed up and ready to peck. Beneath her are two eggs, roughly the size of a golf ball. Bad photos, these, but we felt like cads bothering her.

Photo #6 is your typical family album stuff, again showing Sherlock, who attempts to appear intelligent, while watching the person. To the left of Sherlock appear Sid and Moe, who didn't want any part of the entire photo session.

Photo #7 illustrates correct nest-box placement, at the ceiling of the loft. The front panel of the nest box is removable, so that one may, periodically, clean the nest.

The pigeon's homing instinct is rather near the surface of his psyche. As you can see, it takes about a maximum of ten days to aclimate even a "slow" pigeon to the trap, and after that it is only a matter of pacing them mile-by-mile, up to the point where you begin releasing them at distances from fifty to a thousand miles away.

Current scholarship puts forth the theory that the homers were first bred about 1300 A.D., but in Needham's **Science & Civilization in China,** Vol. IV:2, there is a reference to pigeons being used as message carriers during the Thai-Chhing period (547 to 549 A.D.).

The Chinese had a novel method of using the birds: they would launch them in kites, and when the kite had reached its assigned altitude, the bird would commence flight from his airborne platform. By what method or agency they were thus trained is anyone's guess.

The Chinese also had an elegant little gimmick called the *ko ling*, or *shao tzu*, which was a pigeon whistle, or flute. Whistles made of bamboo, gourd, or horn were affixed to the pigeon's tail-feathers. Once in flight, it is reported that the pigeon whistles were quite pleasing to the ear. I have never tried this, so I cannot say for certain if it works.

For persons interested in keeping pigeons, there is really no excellent, central source of information regarding either loft construction or training (other than the publications which I have cited in earlier correspondence to you). As to feed, I am able to recommend the Joseph Nesbitt Company, 2544 Castro Valley Blvd., Castro Valley, California. They provide an excellent feed mixture for racing homers, which is known as Formula 26 Racing Food. It is a combination of Canada Peas, Maple Peas, Austrian Peas, Corn, Wheat, and Sorghum Grain. I am given to understand that the Nesbitt firm also carries in stock the plastic message capsules, which are affixed to the pigeon's leg by means of an elastic band.

I am having some very rudimentary plans drawn up, illustrating basic loft and trap construction. These I will give to anyone who is interested, upon receipt of a self-addressed stamped envelope.

Andrea — I hope the above is of some help to you. I do wish I had the time to really do the subject justice, but here we are occupied with writing three books at once. If anything, your interest in this matter has afforded me a source of relaxation I would not have ordinarily enjoyed, and for this I warmly thank you. Should any of your people want to erect a loft for inter-departmental correspondence, I am at your service.

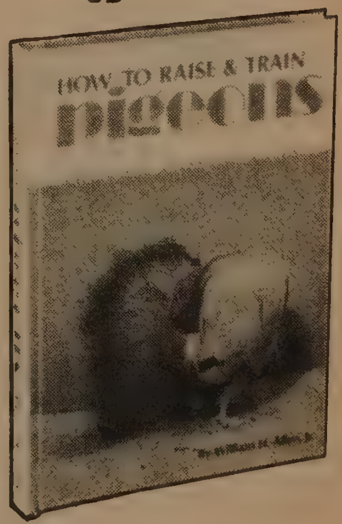
Best personal regards,

William Cassidy
Box 4596, Sather Gate Station
Berkeley, CA 94704

Cassidy says this is the best pigeon book.

—SB

How to Raise & Train Pigeons
William H. Allen, Jr.
1959, 1974; 159pp.
$6.95 postpaid
from:
Sterling Pub. Co., Inc.
419 Park Ave. South
New York, NY 10016
or Whole Earth



Breakfast with Jer

I had to get to work especially early at the Shamrock Hilton Hotel in Houston, Texas on 11 February, and dress in my cute little green busboy's uniform because I was going to be serving breakfast to Jerry, you know the one — the old what's his name Nixon appointee who got to be the first unelected President of the United States — and 60 Fat Cat TV station owners and newspaper editors from the southwest. After having been searched, mainly for tape recorders, I got to stay in the Emerald Room serving coffee, orange juice and later, breakfast, from 7:30 that morning until 11:00, when the meeting broke up.

At 7:45 I was serving coffee to a station manager from Texas, who seemed especially interested in having the meeting break up early so he could go to see his girl friend, when I noticed a rat-faced, weasel-like person come into the room. He looked vaguely familiar, and was accompanied by a big, kind of handsome man who looked like he belonged at a cocktail party at home.

"Why," I thought, "that's Ron Nessen!" I walked over to get a closer look at him. Then I realized the big 6 foot, 6 inch, 260 pound man covered with 20 yards of grey flannel was Rogers Morton. As I was serving coffee to a guest, I stuck out my hand. He shook my hand. Ron Nessen darted away, and I nearly overlooked a much smaller, balding man standing to the side who turned out to be the President of the United States — Gerald R. Ford, or "Jerry," as they all called him. He had entered without a band, no "Hail to the Chief," and no podium. He was handsome and well kept and did not look as pasty and doughy faced as Lyndon or Richard. All that swimming and exercising has firmed his jaw, though he is liver-lipped. He has a nice tan which showed off his dyed blond hair (I could tell it was dyed because I sneaked around behind him to see if the little hairs on his neck were whiter or greyer, and discovered that what hair he has left is uniformly stop sign orange). He wore a blue pinstriped suit, blue shirt, a navy and red striped tie and a liver-lipped grin. He was firm skinned, except around the mouth, wore no makeup and has blue eyes.

If you're ever at a "Biggie's" cocktail party, I think you would probably single out Rogers Morton as a bank president and someone important to talk to, Ron Nessen as a snip of a gossip who could tell you what the story of the week was, Alan Greenspan as a shiny lay philosopher worth a few minutes to see what he had to say, Sid Jones, Assistant to the Secretary of the Treasury, as a bank clerk to ignore, and Frank Zarb, the energy Czar as a wigged ladies' man to avoid at all costs. I do not think you would necessarily notice Jerry unless it would be to think he might be the country club manager who was there to make sure the hors d'oeuvres were okay. He has no charisma, no animal magnetism, and you and I have more crowd presence than he does, even in my costume. But he's wholesome looking, doesn't twitch, isn't nervous, is polite, has a firm handshake. I, of course, was very taken with myself for being there serving breakfast to him.

After ten minutes of mingling, Ron asked the guests to be seated. They sat at 8 tables, 9 persons each, with one or two visiting firemen per table. I served a fruit delight and later a cheese omelet and greasy potatoes. Each guest had in front of his plate a package of matches with the Presidential Seal on the front and Gerald R. Ford embossed on the back, and I noticed that each guest had taken his matches and there were none left for me as a souvenir hunter. I also noticed that Jerry had taken only a couple of bites of his omelet.

Stewart, I've never seen a president or a senator or any candidate for high office, except in auditoriums or on TV in a formal setting and it was unnerving to hear a man to whom someone had just said, "Mr. President, I'm very happy to meet you," called "Jer" and "Jerry" by Ron and Rog.

After his two bites of breakfast, Jerry stood up and gave a 10 minute speech. Ron introduced him as follows:

"Gentlemen, you're all distinguished newsmen and broadcasters. We brought you here to visit informally with Jerry. He's going to make a short speech and then you can ask questions." And then Ron said, "I don't know why I'm making this speech when my predecessor is getting $3,000 a speech, so I'll just sit down."

And then Jerry stood up and said he was running an open White House, "ha ha," and that Rog and Ron would give them their unlisted home phone numbers, "ha ha," and that Alan was available all the time. At this point I noticed Alan Greenspan, the Ayn Rand disciple, who had changed glasses three times — all of them clear non-optical glass as well as I could tell. And Alan Greenspan had been shined. Some way he'd been dipped in lemon oil and some shoeshine boy had shined up his eyes, nose, teeth — entire face — and his glasses. He smiled, and his teeth sweated.

Jerry said (kind of) what follows:

"This nation is on a self-destructive course. By the end of 1975 we'll be broke if we don't change our energy pattern. We don't want 1973 to happen again. We need more nuclear fuel and I'm having a real problem with all the governors of the New England states because they won't let me drill offshore New England, and I'm having just as hard a problem with the governors whose states touch the ocean, except for Texas and Louisiana, though your governor is mad at me for another reason. The other governors in the northern states — Montana, etc. — are having problems because they won't give me enough water to use oil shale. They're giving me a rough time and I need your help."

I thought that with friends like those, he shouldn't be so far from home.

He then asked for questions. Most guests seemed to be afraid to ask any questions because they were embarrassed. They were his guests and any pertinent or probing questions would have seemed rude in the "good old country boy" group atmosphere of this morning meeting.

But a station manager from New Orleans, who was smoking his first cigar at 8:00 a.m., raised his hand and said, "Mr. President, we don't have any ecological problems in Louisiana because next to our ocean are swamps and marshes and oil won't hurt them at all. Why don't you lease more offshore Louisiana property now?"

And Jerry said, "Rog can answer those definite questions for you, but you know we have leased four times as much of either Texas or Louisiana, I don't recall which, than we did before."

The next question was about oil shale and "Jer" said they had auctioned off three or four oil shale packages, but only two had been bid on.

Then, because nobody was asking about income tax refunds, he began to explain it, and he picked up a house bill which he said was 160 pages long. "I sent this bill to the house and they're not at work." He then waves a 4 page bill, "This is the only one they've passed and they're denying the right to raise these prices, and we won't have fuel rationing except OVER MY DEAD BODY."

I was very impressed because it was an exact repeat (except for the necktie) of the speech he had made on TV the night before.

Then Jerry said that they were a much better audience and much more astute newsmen than the Washington Press Corps, and he sat down to finish his now cold omelet, but then abruptly stood back up and said, "Inflation! No one has asked about inflation and my program for fighting it. An institute as prestigious as the Wharton School says it will only cause 2% inflation if we ask the other countries, ah . . . let's see . . . the other four, to save on their oil too, and they are . . . let's see, Rog . . . England, Great Britain, France, and, ah . . . Germany, and, ah . . . ah . . . ah . . . Japan," and then he sat down.

A middle-aged guest with a moustache leaned across the table and said, "Mr. Secretary Greenspan, how much in dollars and people will gas rationing cost?"

And the man who knows everything, the numbers man, said, "We cannot compute it. It's too vast, especially when you take into account that everyone's grandmother would get a driver's license so they could get coupons, and with the advanced art of counterfeiting these days, everybody will be making coupons."

The same guest asked, as Greenspan changed his glasses, "What will happen to long term interest rates?"

He said, "If I knew I wouldn't tell you."

At this point Ron Nessen stood up and announced that the breakfast was over. It was one minute till 9:00. He said Rog would give them a rundown on energy and Sid Jones would give them a rundown on the economy, but he and Jerry had to catch a plane to Kansas, and that he was going to give them a leak. The leak was that in Ford's speech in Kansas that afternoon he was going to announce a new program.

When I got off work that afternoon, I watched his speech, and the only thing that was different was that he had changed ties — it was red with brown circles on it.

Rog Morton stood up and talked for an hour using four letter words but not the more violent of them. He said they'd been traveling all over the country jockeying for a position with Congress and that the hotels in Dallas did terrible laundry. They starched his shirts so stiff that his neck hurt. And that later he was going to his favorite place — to Middle America (Midland, Texas) and maybe Midland would not be as bad as Portland, Oregon had been. He said he had to get back to the "damn" capitol to talk about the "damn" Baltimore Canyon oil lease which is someplace out in the ocean. He seemed smart. He knew how many barrels per person the Japanese and Germans used compared to us. He seemed like one of those personable adult people that I had moved to the land of folly to separate myself from, the kind of person I am trying to avoid for the rest of my life. He was properly disdainful of foreigners and Arabs and the new technology.

Someone asked Rog about solar energy, and he said, "Be my guest, would you? Here's a flashlight and batteries — go heat your house!" He repeated Jerry's statement that you couldn't store up the sunlight except during the daytime on clear days. He then departed.

Texas' Lt. Governor Bill Hobby was there and had a hangover that wouldn't quit. He looked like he'd had a bottle of cognac at 5:00 a.m. I got a sniff of his breath as I refilled his water glass, and it did not smell — maybe it was vodka instead of cognac.

Assistant Secretary of the Treasury, Sid Jones addressed the group and said that if everything kept getting as bad as it seemed, by 1990 the government would control everything and he had to stop it. A $50 billion deficit was needed to get the government back on its feet. He told us how many billion they would be borrowing each month in 1975. By that time most of the dignitaries had drifted off — some were still taking notes. And Sid said he just hated layovers so he was going to cut short the briefing at 10:30 instead of 11:00 so he could make his 12:00 airplane. And then he left.

Two asides:
While I was talking to my pal as we cleaned up the Emerald Room and put away the best hotel dishes, he said, "Mister, you know, last night you took me to dinner with some conceptual artists and they talked about what was going to happen like they knew, and then this morning we served breakfast to all those politicians and they talked like they knew what was going to happen, and I think they were a lot the same."

Second, when I told my old lady about the Presidential breakfast scene, she said, "You'd better hurry and write it down or you'll forget it."

Ho Hum or Stars and Stripes,
Leo Wyoming
Amarillo, Texas

THEY JUST SORT OF LAY THERE WITH A DAMP SMILE..
WIN
MILK
BREAKFAST OF CHAMPIONS

Cartoons by Dan O'Neill

Jack and His Ego

BY GURNEY NORMAN

Illustrations by Steamboat

One time a big monster come into Jack's district, eating up the land and scaring people away from their homes. Then Jack and his brothers Will and Tom went out and killed it.

You've probably heard that story. *[Spring '75* CQ.*]*

But did you hear what happened to Jack after that? About him getting the big-head so bad he wouldn't hardly speak to people any more?

Pull up a chair by the fireplace here and I'll tell you about it.

Now the thing about Jack was that even before he killed that monster, he was well known around the mountains. He was a good hard worker, Jack was. He could do any kind of farm work there was to do. He was a good blacksmith, and harness-maker, and animal-doctor too when he had to be. He could carpenter, lay brick, build chimneys, weld, and build swinging bridges with the help of just one man. And he was good-hearted too, Jack was. He was always ready to do favors for people, help them out when they needed it. Everybody that knew Jack liked him just an awful lot.

But then he went and killed that monster and got the big-head over it, and Jack's friends didn't know what to think about him any more.

Jack even got to acting proud around his brothers Will and Tom. He seemed to forget that they'd helped him kill the monster. Jack acted like he'd killed it by himself and on top of that, he acted like being a hero made him too good to do any work around the home-place. Instead of going to the field with his brothers in the morning, Jack got so he'd sleep late, and then when he would get up, he'd head out of the hollow toward town, looking for people to brag about killing the monster to.

One day while he was in town standing around with a bunch of men swapping knives, a newspaper reporter came up and asked him if he was the same Jack that had killed the monster with a hoe-handle. Jack straightened up his shoulders and smoothed down his hair and said, "None other."

"Wait right here," said the reporter. And he ran into the hardware store and came back out with a hoe. He stuck the hoe in Jack's hand, then stepped back and took his picture. A day or two later that picture was in every newspaper in the land. "Jack The Monster-Killer," it said underneath. "Boy Kills Beast With Hoe."

Jack bought every newspaper he could find, then went around the district giving them away to people.

Will and Tom thought it was bad enough for Jack to be going around the district showing off so bad. But when they heard that he'd been invited by the King to come to the capitol to receive The King's Award, the brothers knew that Jack was in bad trouble, and that they had to do something to help him, quick.

"I can't think of nothing to do," said Will.

"Aunt Haze will help us," said Tom.

And so the evening before Jack's train left for the capitol, Will and Tom finished up their chores and set out across the mountains to Ancient Creek, to talk to old Aunt Haze about the problem.

They had to walk several hours to get to Ancient Creek and it was way past dark when they got to Haze's cabin. But the boys saw smoke coming out of her chimney, and a lamp burning inside, so they knocked on her door and Haze let the boys in.

Old Haze was glad to see Will and Tom. She didn't get much company any more. In the old days, people used to come to her cabin all the time to get her to doctor their wounds and sores and ailments. She was a granny-woman, a midwife and herb doctor and, according to some, a witch as well, who had supernatural powers. After the railroad came to the mountains and brought in modern times, people quit going to see Aunt Haze like they used to. Some people were even afraid of her. They told scary tales about her having the evil eye, and such.

But Will and Tom weren't afraid. They'd been brought up to love old Aunt Haze and to trust her. Way back in the generations, Haze's people and their own were related, and Will and Tom were proud to claim kin to Haze. They looked on her as they would their real aunt, and every time anybody in Will's and Tom's family got sick or had troubles of any kind, they went to Aunt Haze for help.

As the boys sat on the bench in Haze's cabin, drinking sassafras tea and warming themselves in front of the fire, they told her what had happened to Jack. They told her about the big fight with the monster, and how Jack had got so conceited over killing it they couldn't nobody stand to be around him any more.

"Jack aint struck a lick of work in a month," said Will.

"Me and Will has to do it all," said Tom. "We miss Jack helping us, but when we try to talk to him about it, he wont pay us no mind."

"All he wants to talk about is how he killed the monster," said Will. "He don't even remember that me and Tom helped him fight the thing."

"And now he's getting ready to go to the capitol, to accept The King's Award," said Tom.

Aunt Haze sat a long time, smoking her pipe and gazing at the fire in the grate. Finally she said, "Well, it's clear. Jack's been put under a spell and we've got to figure out a way to break it."

"A spell!" said Tom.

"Oh Lord," said Will. "They've got poor Jack under a spell."

"Yep," said Haze. "I've seen it on people before. It's a hard thing to cure. But it can be done if we do things right and do 'em quick enough. When's Jack's train leaving?"

"Sunrise tomorrow," said Tom. "He's spending tonight in the hotel over in town."

Aunt Haze leaned over to the fire and knocked the ashes out of her pipe. "That don't give us much time. But we'll see what we can do." And she stood up then and went to the corner to get her shawl and her walking stick.

"Where you going?" asked Will.

"Don't slow me down with a lot of questions," Haze answered. "We've got a week's worth of walking to do in a single night, we can't waste no time. You all come on."

Will and Tom looked at one another, then back at Aunt Haze. "We're tired out from getting here," said Tom. "We couldn't walk a night's worth in a night, let alone a whole week."

"You can do a whole lot more than you think you can when you have to," said Haze. "But you can't do it sitting down. Come on now, time's a wasting."

Will and Tom weren't eager, but they got up and followed old Haze into the night. The moon was behind a thick cloudbank and it was dark as pitch in the woods. Before they'd gone ten yards along the path Tom tripped over a root and fell down, and Will fell down on top of him. "It's too dark to walk," said Will.

Tom said, "I can't see a thing."

Haze told the boys to wait where they were. Then she stepped off the path into the trees and rummaged around behind an old half-rotten log. When she came back she was carrying a piece of bark covered with foxfire that shined in the night like a moon. She broke the bark in two and then tied the pieces to her shoes with strands of wool she pulled out of her shawl. "Watch my feet," she said. "Put your feet where I put mine and you can walk forever and not get tired."

Will and Tom couldn't see anything except the foxfire on Haze's feet, but that was enough. They put their feet right where she put hers, and followed Haze along the path through the dark woods.

Even though they couldn't see where they were going, the boys could tell they were going uphill. They felt the path rise and wind, and as they got higher on the mountain they felt the air grow thin and cold. Just as Haze predicted, neither Will nor Tom got tired. But as the cold air cut through their skin and chilled their bones, they started complaining again till finally Will said, "I can't go no further, Aunt Haze. It's too cold."

[more →]

"I'm freezing to death," said Tom. And the brothers stopped on the trail and stood there shivering in the dark.

Haze didn't say a word this time. She just pulled two more strands of wool out of her shawl and tied one each around the boys' necks. The shawl was one Haze's great-great-great-grandmother had made by hand, so far back in the ages even Haze didn't know just how old it was. The wool was of such quality that a single thread could keep a person warm, as Will and Tom learned when Haze tied the strings around their necks. Haze set out up the trail once more and Will and Tom followed on behind.

They were way up in the cliffs now. It was still night time, but it wasn't as dark among the cliffs as it was down in the trees. In the east the faintest trace of dawn was trying to light the sky. It wouldn't be long now till sunrise. It would feel good to be in the sun again. But sunrise also meant that Jack's train would be leaving the depot over in town. Will and Tom hated to doubt Aunt Haze's wisdom, but here it was nearly sunrise, and as far as the boys could tell, she hadn't done a thing yet to help poor Jack. All she'd done was lead them out on an old mountain, so far away from town they'd never get back in time to save Jack. The boys were on the verge of telling Haze they didn't want to go any further, when she stopped and announced that they'd reached their destination.

"But this aint nothing but an old hillside," said Will.

And Tom said, "How come you to bring us way up here, Aunt Haze?"

"These cliffs is where the great blue eagle lives," said Haze. "He's going to help us do a week's worth of walking in a night."

As soon as Haze said that, a giant eagle flew down from a crag and lit on a rock right next to where Will and Tom were standing. It was the biggest, fiercest-looking bird the boys had ever seen or heard tell of. If Will and Tom hadn't got their feet tangled up and fallen on top of each other in a heap, they'd have taken off running down that mountain fast as they could go.

Haze laughed as she picked them up and dusted off their clothes.

"You boys are a sight," she said. "You don't have to be afraid of this eagle. He's our friend. He's going to help us break the spell they've put on Jack, and set him free. Aint that right, brother eagle?"

"I'll help out any way I can," said the eagle.

Will and Tom tried to take off running when they heard that eagle talk. But Haze had hold of their shirttails and she made them stand there while she spent the next few minutes telling the eagle about poor Jack's situation.

"What do you want me to do?" asked the eagle when Haze had finished talking.

"I want you to fly us on your back to every house in the district so we can tell the people that the reason Jack's been acting strange is because he's under a spell. The King's trying to trick Jack into coming to the capitol to work for him instead of staying home in the mountains and being with us. We need to tell the people that Jack's a prisoner on a train about to go away forever, and if we don't stop it none of us'll ever see Jack alive again. We've got to tell the people to get to the depot quick, to gather in a big crowd on the tracks and not let that train leave till we rescue Jack out of it."

"That's easy enough," said the eagle. He flapped his huge wings and jumped down to the ground so Haze and the boys could climb onto his back.

"Oh Lordy, Aunt Haze, you don't mean we're going to fly on this eagle," said Tom.

And Will said, "I declare, I'd just as soon walk."

"Hush up and climb on here," Haze snapped as she settled herself on the great blue eagle's back. "We aint got time for foolishness."

Will and Tom weren't eager, but they climbed on, and held tight to Aunt Haze. With a great surge of his body and a powerful flap of his wings, the giant eagle soared into the air and flew out over the valleys of the district.

They flew in a circular pattern, going to the outlying houses first to tell the people to get to the depot quick, to stop the train. They landed at Neighbor Finley's house, then flew on to Arnold Caudill's place at the head of Hick's Branch. From house to house they went, giving the alarm to the people. The sky was filling with sunlight now. The sun itself would soon be on the horizon. But as Will and Tom and Haze and the blue eagle continued on their circuit, winding it smaller and smaller as they stopped at farms and houses closer and closer to town, they saw the roads in the valleys below filling up with wagons and horses and cars and pickup trucks, and hundreds of people walking, heading for the depot over in town. Haze told the eagle to make one more circle around the district to make sure they hadn't missed anybody. When they'd done that the eagle banked and turned and flew in a straight line toward town.

Just as the sun came up full and round in the sky, the eagle swooped down and lit on the roof of the depot.

"Gee oh, look at all the people," Will shouted as he and Tom and Aunt Haze climbed down.

"I've never seen such a crowd," said Tom.

The driver of the train had never seen such a crowd either, especially one formed all over his railroad tracks. "You all get out of the way!" he yelled from his cab up in the engine. "This train's leaving for the capitol right away!"

"Not till we rescue Jack, it aint," said Neighbor Finley, in the crowd.

"Where's Jack at?" Will yelled.

"Here he is!" yelled Arnold Caudill. "In the first class passenger car!"

Will and Tom and Aunt Haze ran back to the first class car and sure enough, there was Jack, dressed like a Philadelphia lawyer, sitting in a seat all by himself, looking at his picture in the paper.

"Jack! Jack!" yelled Tom. And Will yelled, "Come on out, Jack. We've come to rescue you."

But Jack couldn't hear his brothers. He didn't appear to even notice all the people standing around outside. Even when they all yelled at once, "Jack! Jack!" he still didn't notice them.

Suddenly the blue eagle flew down off the depot roof and said, "Let me handle this." With one quick peck of his beak the eagle smashed the window of the railroad car. Then with his talons he reached in and snatched Jack by the coat collar, and before anybody in the crowd could say a word the eagle flew off into the sky with Jack dangling.

They flew so high they nearly went out of sight. Then they came into view again as the eagle dived like a bullet straight down into the river that flowed just down the bank from the railroad tracks. The eagle dunked Jack good, then flew up high again. This time they didn't go out of sight. They flew in a circle above the gathered people on the ground.

"Jack, are you awake yet?" the eagle asked.

"I think I am," said Jack. "Unless this is all just a dream."

"It aint no dream," said the eagle. "You've been in a dream. But you're waking up now. Do you see all them people down there on the ground?"

"I see 'em," said Jack. "Who are they?"

"They're your friends and neighbors in the district," said the eagle. "They stopped the train to keep you from getting carried to the capitol."

"The capitol?" said Jack.

"Yeah," said the eagle. "You was about to ride the train to the city to accept The King's Award."

"What was I going to do that for?" asked Jack.

"You was under a spell," said the eagle. "But you're waking up now. In fact, I think it's about time to drop you."

"Drop me!" Jack exclaimed.

"Yeah. But don't worry. The folks on the ground'll catch you. Are you ready to get back down to earth?"

"I reckon so," said Jack.

"Okay," said the eagle. "Here you go." With a final flap of his wings to gain a little more altitude, the eagle opened his claws and down Jack went fast as a rock.

Before Jack could draw a breath he landed in the arms of his neighbors.

And when they were sure they had a good grip on him, they stood Jack on his feet.

Neighbor Finley said, "Well Jack, how do you feel?"

"I feel grateful to you all for catching me," said Jack.

"We're glad to have you back among us," said Neighbor Finley. "You been gone a long time."

"Hello brother," said Will. And Tom said, "Hello Jack."

The brothers hugged each other. Then everybody around started shaking hands.

"Where's Aunt Haze?" said Will. "Let her through so she can give Jack a hug too."

[more →]

The people looked around for Aunt Haze.

"We got to find Aunt Haze," said Will. "If it weren't for her, Jack would of been a goner."

"There she is!" someone in the crowd called out. "Up there!"

All the people looked into the sky. There was Aunt Haze, riding on the back of the great blue eagle, heading for the distant hills. As the people watched, Aunt Haze stood up on the eagle's back and waved with both arms. The people waved back, and kept on waving as long as they could see her. Gradually she and the eagle got smaller in the sky, and after a while they disappeared all together.

"I owe a lot to Aunt Haze," said Jack as he watched her go.

"We all owe Aunt Haze a lot," said Will.

And Tom said, "We musn't never forget her."

The people were turning away now to head home and get on with the new day's work. As Jack walked along between Will and Tom he said, "Boys, what kind of work are we doing today?"

"We're clearing out a newground," said Tom.

"Getting it ready to plant," said Will. "Are you ready for a little work?"

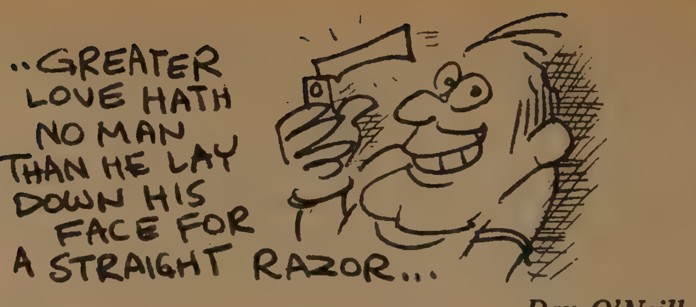
"I'm ready," said Jack.

And the brothers walked on home together, arm in arm. ■

Author's Postscript

The Great Blue Eagle became available to me for use as a character in "Jack and His Ego" one evening while I sat listening to George Davis, The Singing Miner of Hazard, Kentucky, sing "Death of The Blue Eagle," at the same time I was reading this quote by Wilhelm Grimm regarding folk literature: "The mythic element resembles small pieces of a shattered jewel which are lying strewn on the ground all overgrown with grass and flowers, and can only be discovered by the most far-seeing eye. Their signification has long been lost, but it is still felt and imparts value to the story."[1] The Blue Eagle is a piece of the shattered jewel which was lying in an obscure record album. It is also lying, perhaps overgrown with weeds by now, in the minds of older Americans who remember the early years of the Great Depression. The nearly-lost signification of the Blue Eagle is that the bird was the symbol for the National Reconstruction Act, the old NRA, an early New Deal program which brought hope, for a time, to millions of working-class people hit hard by the depression. The Blue Eagle was a mythical bird that common folks were bound together by. So it seemed fitting, perhaps inevitable, that the Eagle appear in my story as the unifying force capable of flying around to gather the people together for what I consider a political act: the rescue of the folk hero Jack from his own heroism, which was about to get him co-opted.

— Gurney Norman


..GREATER LOVE HATH NO MAN THAN HE LAY DOWN HIS FACE FOR A STRAIGHT RAZOR...

Dan O'Neill

Straight razor

Dear Epilog;

I am writing chiefly to flesh out Roger Hyde's excellent article on the straight razor *[EPILOG p. 583]*. I switched over from Gillette to a straight razor about three years ago and my face never felt better.

For openers, there are two kinds of straight razor: the wedge and the concave. These words are used to describe the shape of the blade in cross section. The wedge is preferred by most professional barbers, the concave is easier for an amateur to keep sharp.

Honing: don't attempt it unless you know what you're doing. Even a lot of professional barbers are not terribly good at keeping an edge on a straight razor. I have three which I use in a sort of random rotation. Before shaving I strop the razor and about once a week I apply honing compound to the strop and tune up the edge. Honing compound is available from a barber's supply shop; jeweler's rouge can also be used for this purpose. After shaving I rinse the razor and then wipe it dry and completely free of fingerprints with a chamois. The acid in a fingerprint will eat into the surface of the steel and stain it. About every three or four months I walk my razors down the hill to a good old time barber who hones them for a buck. If you ever drop a straight razor or otherwise damage the edge, take it to a barber supply house and they'll grind and hone a new edge for three or four dollars.

The best steel and therefore the best razors I'm told, come from Solingen, Germany. If a razor comes from Solingen it will most likely say so on the blade. Dubl-Duk and Heinkel (I think I'm spelling it right) are the two biggest brands, but there are plenty of others. They start around $10-$12 and go up from there, the big wedge shapes going for around $25. I have a Spanish Filharmonica for which I paid $8 new, a Swedish Dovo ($6 new) and a Solingen Mehl ($2 used). They all perform about the same, the Swedish one having the softest edge.

There is a strop crisis and they ain't making them (or at least as many of them) as they used to. The reason for it is the decline in the number and use of draught horses (everything is connected to everything else). So get the best strop you can. I recently saw a beauty of a strop, cross-hatched in the back for greater flexibility, for $12.

I tested Hyde's advice about buying used razors from a barber and in the past couple of weeks have acquired three (one of them spectacularly beautiful) for a total of $5.

A word about barber supply houses; most of the places I've been in are run by ex-barbers. If you show an interest in their craft and a desire to learn, they will talk your arm off about straight razor technique and lore. A great place to get shaving soap, shaving brushes and shampoo. In one place I encountered a neatly designed tool which accepts half a double edged blade and turns it into a straight razor. If you're sincerely interested in buying a straight razor, a barber supply house will lay out 20 of them for you and deliver a five minute lecture on each one's advantage and disadvantages.

The world's record for shaving a man with a straight razor? Seven seconds set by a barber, now retired, in Yuma, Arizona.

Has anyone of your readers had any experience with the Rolls razor?

Regards,

Erik Timmerman
Los Angeles, California

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[1] The Wilhelm Grimm quote is used by Padraic Colum in his introduction to *The Complete Grimm's Fairy Tales*, recently re-issued by Pantheon Books.

Ancestor worship

Dear Sirs:

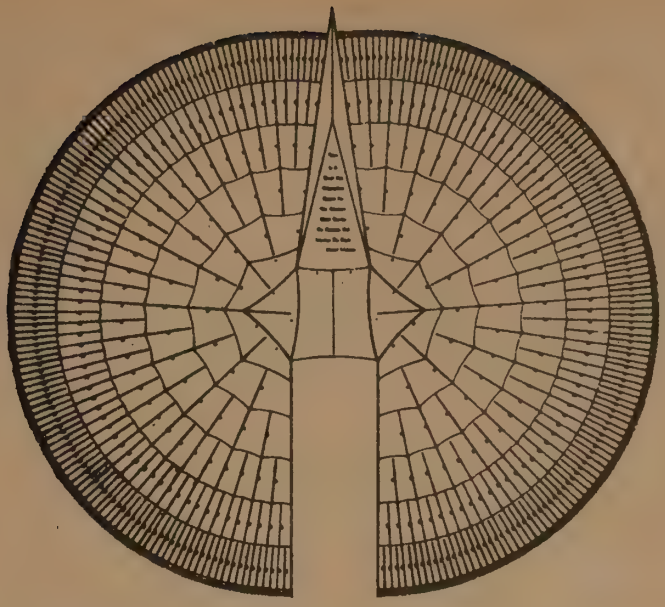
After reading the review of "Old Glory" (Urban Living, pp. 584-5) in your **Whole Earth Epilog**, I became interested in tracing my family tree. Luckily, the college here — Univ. of Ark. at Little Rock — offered a non-credit course for $2.00. Wow! A whole new dimension opened up. Now I spend most of my spare time in the Archives, in old courthouse records and in the genealogy room at the library. Not only can you learn about your ancestors but see history in a whole new light.

To get started, check these two books at your library: **Search and Research** by Noel C. Stevenson; **Searching for Your Ancestors** by Gilbert Doane. The Enerton Publishing Co., P.O. Box 368, Logan, UT 84321 has any supplies you might need. They have a free catalog. Also the Supt. of Documents, U.S. Gov't. Printing Office, Washington, DC 20402 offers these: "Where to Write for Marriage Records," Pub. #630B, 15¢; "Where to Write for Birth & Death Records," Pub. #630A, 15¢.

The upcoming bicentennial has spurred renewed interest in American history and genealogy. In order to appreciate the present, we need to know our past. Anyone who takes a taste of genealogy will find himself a lifelong addict.

If anyone gets "stuck" even after following the advice of the above publications — write and I'll try to help. (Send self-addressed, stamped envelope please.)

Paige Mayer
24 Lamont
Little Rock, AR 72209



22 x 26 inches, folds to 8½ x 14, punched to fit the 9 x 15 binders. May also be used for framing. Permalife paper.

10 GENERATIONS 1022 ANCESTORS

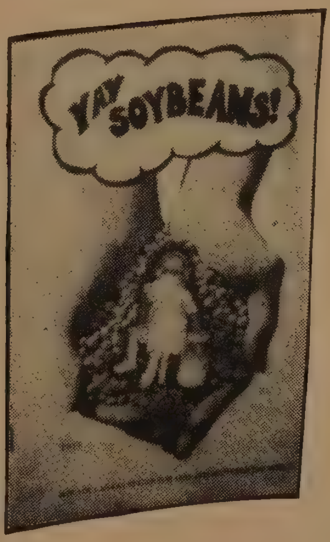
The largest pedigree chart we have ever offered. It is a double-fan arrangement with the paternal ancestors on one side and the maternal ancestors on the other. There is room on the first five or six generations for small pictures to be placed by the name and data of each of your ancestors. Enough space is also provided to record 20 or 30 descendants of the first couple on the chart (Nos. 2 & 3) and by using the corners of the sheet you may enter several additional generations — making it possible to get as high as 12 to 15 generations of ancestors on some lines.

— Genealogical Supply Catalogue, Logan, Utah

Yay Soybeans!

A good little cookbook on how to get all your protein straight from the ground. From Stephen Gaskin's Tennessee Farm.

— SB
[Suggested by Matthew McClure]



Yay Soybeans!
The Farm
1974; 13pp.

Free

from:
The Book Publishing Co.
The Farm
Summertown, TN 38483

Buy your soybeans at a farmer's supply store. Get a one bushel (60 lbs.) sack of seed grade beans. (A bushel is enough to last an average family of four well over a month.) They will be uniform, clean, high quality beans with good germination in case you want to sprout them. It will be much cheaper to buy beans this way than in other stores.

•

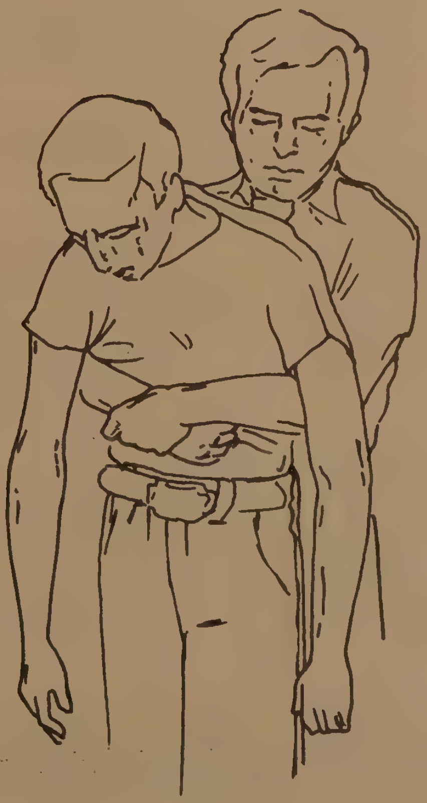
Vitamin B12 is the only thing that must be added to this diet, and a little of that goes a long way. A small boxful supplies the whole Farm for several months. With a pressure cooker, a blender, and some vitamin B12 capsules you can feed your family a complete and tasty diet very cheaply. We eat for about 40 cents a day per person.

Heimlich maneuver

To prevent choking to death on something caught in your throat, have a friend embrace you from behind just under your ribs and squeeze really hard and suddenly. That thing flying through the air is what was strangling you.

10 people a day die in the US choking on food. The procedure invented by Dr. Henry J. Heimlich at The Jewish Hospital, Cincinnati, Ohio, has saved over 100 lives. Write him for details.

— SB
[Sent by Dr. & Mrs. Karl Menninger]



Relative Poverty and Frugality

BY **PAOLO SOLERI**

The attempt of this essay is to show relative poverty not as an expedient toward a certain goal, but as the brick and mortar for the construction of a condition of equity which does not seek atonement through penance and which might favor instead transcendence and creation through a lean ecological-theological congruence.

It might not be possible to get into the subject of frugality if not for the observation that ignorance is the lock to the door that needs opening. Since no one ever ceases to be ignorant, the assumption of knowing the right key is to risk a position "dangerously prone to presumption." Be that as it may, one can define in general two kinds of ignorance: ignorance for lack of experiential processes, and ignorance from the inability to profit from experiential processes. (Every process is experiential but the experience does not necessarily identify with the subject matter.) In reading about the Victoria Falls, one "experiences" the experience of the context of youth. The second case of ignorance is of the more or less limited "sensitivity" of all ages.

Since growing up is the process of "applying" consciously, and unconsciously, cumulative experiences, the learning-doing process, it is in the nature of things that at the beginning (and all situations are, in part, "beginning situations") youth can only turn to a vicarious and mimetic modus operandi based on trust, trust in those who had some learning/doing experience. See the little sister aping her elder sister, sons and daughters playing grown-ups, or see the sergeant playing colonel . . . . For most of what we do this modus operandi does not change throughout life. It is only in what we "specialize in" that we transfer some of this trust from others into trust in ourselves. When trust breaks down, the breakdown of the Sixties for instance, three states of being are present: contempt, cynicism, or humility. Then we had a surfeit of contempt on the part of a few, we had a majority in a state of cynical indifference (from both groups a selection of nihilists staging themselves above the melee in utter boredom), and we had certainly and fortunately also a good amount of humility. But humility tends to be silent . . . a condition that unfortunately blurs the humble into the "silent majority."

The reason why ignorance is the lock on the door to frugality is that frugality is not so much for the poor who "cannot do better," but for that person who has opted willingly, in fact intentionally for it. This person must know, at least viscerally, what is the rationale for the choice, since not to know

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Relative poverty is non-relative wealth. The fact is even truer than the truism. Every step I've made in the poverty direction — so long as neither idealism, laziness, or real deprivation forced the step — has been a reward.

The technique is simple. (I learned it from Dick Baker, who learned it from the Japanese.) The way to stay high is get rid of everything that brings you down. A friend adds, get rid of it WHEN it brings you down. There in the laundry is the shirt you hate. Throw it now . . . (to someone who can use it).

By and by you won't have much.

Luna Leopold, the dean of water-flow scientists, says that a river is always either eroding or depositing. Young rivers erode, generally, and old ones deposit. If you stop depositing, you stay a young river.

Paolo Soleri is one. More than most of us do, he lives what he writes. It's unfortunate, though not surprising, that what he writes has been much overlooked. People see those spectacular models of his arcologies — visionary cities — and rush to praise or condemn. (See CATALOG p. 83.)

Rush is our sickness, which frugality cures.

This essay of Soleri's, written last June, was sent to us by Stewart & Lou Sagar of OPTII (Organization of Planning Teams International Incorporated).

— SB

Brand

Paolo Soleri (bald spot and shovel at center-right) participating in a sand castle at Baker Beach, San Francisco, May 1975.

this "rationale" is to be ignorant of the issue and consequently to be blind to the condition of man. Frugality must come from synthesis not from quiescence or weakness.

Synthesis is a "conclusive action" in a process of discrimination and elimination by which few essentials are established as mooring for one's own existence. It is a divesting of the physical and transphysical self as much as it is a shrouding of both with one's own uniqueness. A divesting so that the garment of frugality can mold itself more intimately to both the tangible and the intangible self. If it were otherwise, if indigence were to be the context of frugality, then one would but stand as a synopsis of the least human of the human condition, the condition of wretchedness where the mind cannot work since the body is dying. One situation where the body is dying is when somatic man is ignored in the poor assumption that once the flesh is fed with the right protein, one can forthwith turn on the psyche anchored to it.

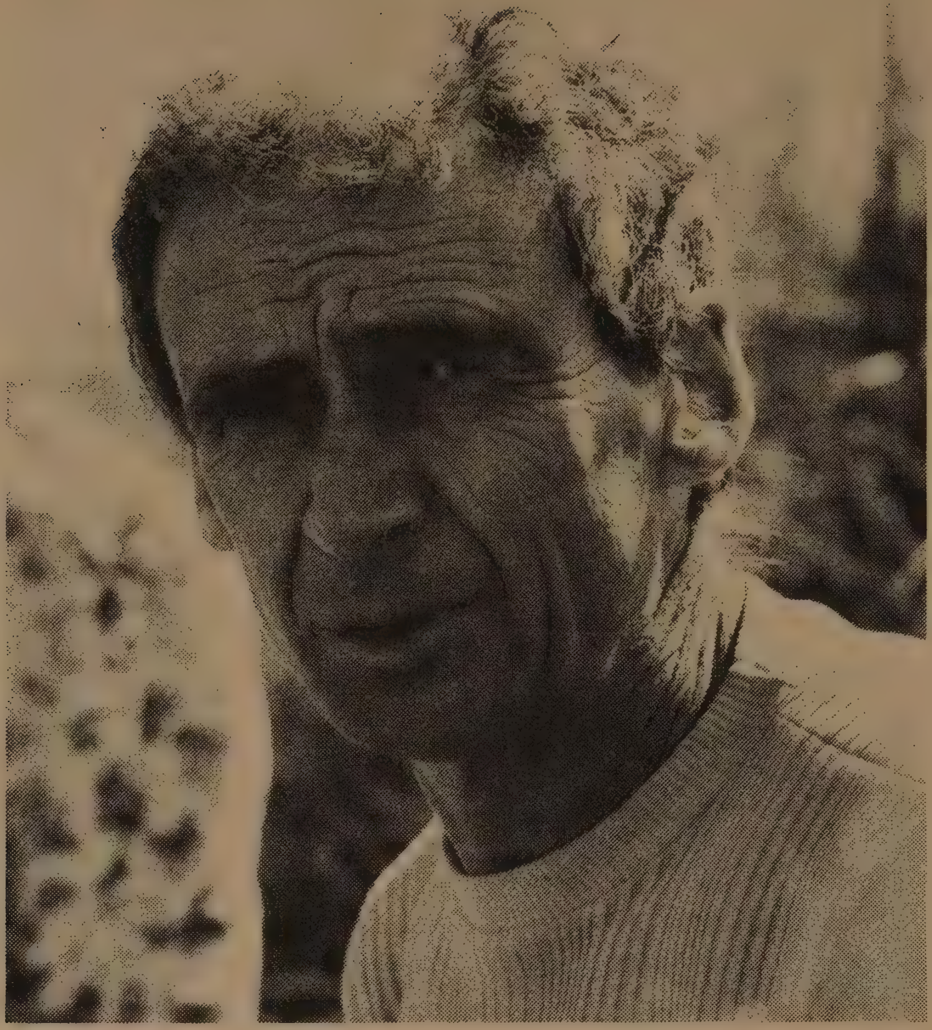
The intent of relative poverty is not to suffer and do penance for the sins of man and specifically for the sins of avarice, gluttony, and covetiveness. It is instead to glorify life through the lean, conscious exercise of one's energies in the face of odds which when understood cannot but show themselves as "overwhelming." It is at its best to "perform the tragic sense of life itself," well-knowing that that is the only true sense and it is a sense of unfathomable depth. A sense full of seminal particles, a sense that can give reason and scope to sufferance, that immense, towering ogre of all history, an history therefore suffused with beauty but also drowned in savage cruelty. "To impersonate the tragic sense of life" is not, one must be clear, a morose and bleak prospect. It is a conscious development of the self along a path littered with things that "must be ignored," and a path irksome with the unexpected, the will breaker, the mystifier, the barbaric, the blasphemous, the malicious . . . .

With all of them, and in spite of them, one's spirit can construct a not-so-ephemeral "counter reality," the intent of which is grace and deliverance; a demonic deliverance inasmuch as it is future-oriented, a creation. A deliverance which cannot be but demonic since the unknown is the warp on which it has to construct itself and the unknown gives oracular (demonic) tinge to its stimuli.

But if this grace is suffocated by wealth which mistakenly thinks it can buy grace, then those buffers which are necessarily part of the countenance of one's own life become the indispensable crutches for a life gone astray in the pursuit of happiness, a pursuit which is made ephemeral by the fragility of the scaffolding employed to reach for it, the inner fragility of an all-insured, all-granted happiness via affluence.

To the fragility which is innate in the matching if not identifying inner grace with hoarding, with outer order and the power to maintain it, is clearly added now the precariousness, in both physical and moral terms, of such a condition vis-a-vis the indigence of most of humanity. We are thus faced with a double sin. A sin against one's own spirit (worth) and a sin against the spirit of the specie of which our own spirit is part and parcel.

Then the intentional condition of relative poverty has not the seal of sainthood but has the rationale of the human condition when such condition is perceived with some depth and deeds follow up on the path of understanding. That some or most politicians, economists, managers might see the frugal way as the suicidal way simply shows what the materialistic turn of mind does to man, because if it is certainly true that by "its application" havoc would play for awhile with the western system, the "consumerism societies," it is also true that such societies have not lifted the spirit of man one iota above the quiet and not so quiet greed, which conspicuously characterizes them. A greed by now infecting endemically that part of mankind which has been touched by the "technological revolution." It might well be that this historical phase of the specie has to pass through the quagmire of greed to taste, "first-hand," the bitter sterility of such a condition.



Soleri

Only after that may man choose "freely" to move into the future with less "technological" backpacking and more inner conviction.

One of the convincing aspects of arcology is that it stands parallel with the individual, private, frugal ethos, for an equally frugal, public, "universal" condition. It does environmentally for society what frugality does individually for the person. Naturally, the visitation of grace upon arcological, frugal man is far from automatic but what is automatic is that as a direct consequence of one's willful abdication from affluence-opulence, the wealth of the earth is given the chance for a more equitable distribution. A forced abdication would only mean that for the time being someone or some society is quarantined in the indigent's station, that station where revolt and vendetta mouth their pressure. If, on the other hand, abdication meant only withdrawal from society and its productive cycles, applying the tenet that what I cannot get for myself I will not produce for anyone else, then one deprives man of those tools and those products that need to be produced so that the "strength" they bring to man can be equitably shared.

In a humanized family of man, the USA could double its productivity and "export" two-thirds of such wealth to other societies by a willful vow of relative poverty. This might have to become a must since in Christian terms that is what it ought to be and concomitantly that is also what "ecologically," in survival terms must be. It is not pure coincidence that theology and ecology come to be a one and indivisible process.

One can hear the laughter or the bone-rattling indignation of a "successful" society at the picture of itself as the good samaritan, as if I were proposing some sort of mass philanthropy making the world into a limbo. I am really suggesting instead a civilization which in a conscious, lean exercise of its energies and knowledge has no false god to indulge in. To such end, some steps seem necessary:

1) Free itself from the hypocrisy of equality.

2) Understand that mimesis and vicariousness are the indispensable ways by which the anguish of the specie can be contained (the norm) within bearable boundaries, when it cannot be transfigured (the exception) into grace.

3) See and feel that freedom to be equally mediocre is a sorry state of being.

Why do I think I am on target with these rather oblique statements? For one, willing or not, we are in the theological realm, that is to say, in that kind of reality where the individual is, for the sake of himself and his progeny, subordinated to something which is more than the sum of all components of life. (From this standpoint, the USA fares poorly as a religious society. "For God and Country" has a dead-pan ring.)

Teilhard de Chardin, speaking of sufferance, compares mankind to a tree whose branches bear different kinds of loads and are in different health conditions (see point 1). But since all branches are part of the tree's integrity, they all have part in its development; all branches, and indeed the most suffering ones, partake of the glory of the tree.

If they partake of it, they are not identically responsible for and expressive of it. If it were so, one could suggest the following paradox: the pruning gardener (God!?) working on a pair of twin trees; on one He would trim off the weak limbs, and on the other He would prune off the stronger limbs. "Good sense" would say that the first tree has been well-conditioned for a further development along an "inner structural design" and that the other tree has been maimed. Carry the analogy too far and you play into the hands of the God-chosen people ethos. But to ignore the uneveness in the component of the system is to be blind, hypocritical or perversely pious. For the human tree, the case is not whether to cut or not to cut the weak branches but it is to acknowledge that the true compassionate way is to see that the weak branches, which are making their contribution according to their strength, are vicariously joyful in the reflection and mimesis of what the stronger branches do for the tree (see point 2).

To stay awhile longer with the analogy, but defining the tree as the bearer of the fruits indispensable for the betterment of man, and man as standing under the tree shorter in stature if tall in hunger; only a human pyramid will put the fruits within reach. The pyramid will go up according to "physical laws and acrobatic skills." The most limber and best conditioned individuals will have the joy of holding to the fruits (and there for an instant rejoice in the life "current"). Then they will toss down the fruits to the "less fortunate" (the vicarious enjoyers). One of the assignments of civilization is, of course, the construction of scaffolding which will afford to anyone the thrill of picking the fruits. But it will never happen that everyone will find the courage, or the interest, or the perseverance to pick the fruits. For most it will be the case of getting fed by a diluted version of the burning flame-fruit. I must make clear that nowhere in the pyramid do I see yet the sign of mediocrity, but only the signs of individual "limitations."

Leaving the two analogies, one can look at societies and their history. Men and women can "equally," or better equitably, enjoy what reality, of which they are the makers, brings forth in the measure and the terms that the worth which is in them can afford to them. We enjoy, or suffer, which is the same, in the measure of the reflection of what we are in what we behold or do, not one iota more or less. We are instruments which can only produce those sounds which are made possible by the sophistication of our make-up, if it might be unjust to say that a "jug band" cannot do for a violin concerto, since it is more fair to consider all of us as violins, we might want to consider that: 1) we are not just the passive instruments but the active players of ourselves, thence what we play of ourselves we make ourselves into; 2) as violins we might be well made or poorly made; the quality of the instrument is a (genetic) fact, as yet beyond our doing and consequently the quality of the sound will be, if we so want to characterize it, a fatal parameter in our performance but the substance of the music is of our making and only of our making . . . or is it? It is not so much of our making as it is of our choice. The Beethovens and the Debussys play music of their making on "jug bands" or on Stradivariuses. The "professional players" choose among the repertory that which suits them to perform. Both the professional player and the listener vicariously enjoy with the composer the music he has made himself into, and by a process of mimesis, doing on our own what someone else has originally done, we even co-create or re-create figments or fragments of it.

We are all pupils of someone who most of the time we do not know and we do not need to know. Each of us is, in fact, the pupil of literally thousands of teachers, our fellow travellers in the journey from beginning to end, thousands of them, both contemporary and those who have gone before. In such a situation, the most damaging thing one can do to oneself, and that society can foster, is to go after the emptiest of all music (a sympathy for impiety). This is to seek mediocrity and to sanctify it with the consumer ethos which maintains that the buyer can only purchase what the producer makes; to which the producer retorts that the nature of the product is a direct result of the market (consumer) demand. This after all is the most dangerous thing democracy has to cope with and in the Western world it has coped with it poorly.

If the elitist societies of the past, Western and Eastern, have something to show it is that freedom has not been identified with mediocrity. In fact, it has been a tenet for those societies that only the "exceptional" is free and has the right to be free. By "exceptional" they meant the privileged, a distortion which doomed all of them to extinction. But that position was "easy" then since "social justice" was at best a remote thing.

Can anyone say that the price for non-mediocrity has been too high? What we can say is that if the democracy of mediocrity ("mediocracy" as coined by Frank Lloyd Wright) is the ultimate of freedom, freedom has been a mirage and a poor mirage at that. Its true name is license, the institutionalization of mediocrity by the stamp of approval from the "authority" of the Joneses (see point 3).

This discussion is on target because the point I am making is that mediocrity and frugality do not mix. They can only coexist. They do not mix since frugality is quintessential and mediocrity is "quiescent"; it is then by the reduction of mediocrity that frugality can prevail. A mediocre society is by definition a wasteful society, since it is a society which is incapable of that leaness of thought and action that is characteristic of the frugal condition.

It is then quite clear that contrition and penance do not necessarily fall in the framework of frugality as it should be clear that they should not be excluded from such a scheme as a matter of dogma. This second clause is a necessary corollary because in the Western world it has become axiomatic that both contrition and penance are residual of barbaric and obscure moments of history. In the meanwhile, the psychoanalyst, with his own contrition-penance syndromes, has in those same societies a field day . . . . Contrition and penance come about the soul consciously, or if the society forbids it, unconsciously, but they have to come upon it since the soul is the testing ground for our sense of rightness, while the world and the "persona" are saturated with wrongness.

Wiser societies have not put up such a technologically solid wall between themselves and their anima. Indeed for some of them it is often the extreme in the opposite direction which makes for infirmity. So much is given to contrition and penance as to bring in mortification and a sullen acceptance of "punishment." At one extreme is thus the self-righteousness of ignorance, arrogance and contempt, the true garments of mediocrity, often dressed up in gentle apparel, and at the other end is a meekness blurring into the total helplessness of abjection.

It strongly appears to me that frugality, far from being in the lukewarm center of the line connecting the two extremes, propels itself equally away from them both into an asyntropic flight toward the spirit.

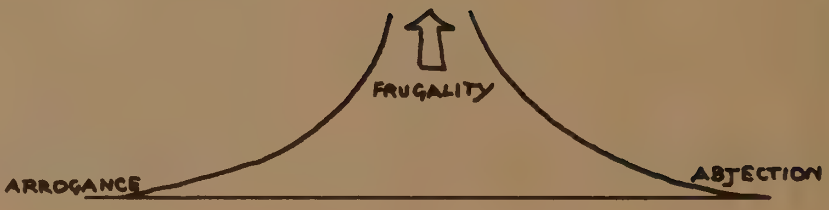
It is naturally easy to fake oneself in any mold, including the mold of frugality. It is up to those who seek to be part of the arcology experiment to examine their own consciences and seek guidance from the flame, tenuous or roaring, they treasure there. The experiment might demand a lifetime test, since the aim of it is the transformation and possibly the transfiguration of contemporary man. This transformation is the most utopian aspect of the experiment as it necessitates a "durational collapse" of tradition into a brief generation time-span. The establishment of a tradition is something that can hardly fit within a lapse of time as short as that. That notwithstanding, if we cannot approximate such a condition, we have a poor chance of succeeding.

Another difficulty inherent to this proposition is that the goal of a tradition is the least fashionable thing to propose in a time when the most popular slogan is "set yourself free, break out of all traditions." The fact that the slogan is absurd does not make it less attractive. In fact, it is attractive because it is absurd (it says that the best way to be absurd is to abide by absurd slogans). It is indeed so attractive as to be propounded by the most established (and absurd) of all establishments, Madison Avenue. Purchase this or that and you will be an "original," unique among (millions of) identical uniques. But then we would not be in what we are in, if our aim was to sway dutifully to the tune of the day.

A glance at the unfashionable position of Arcosanti and its fashionable opposite:

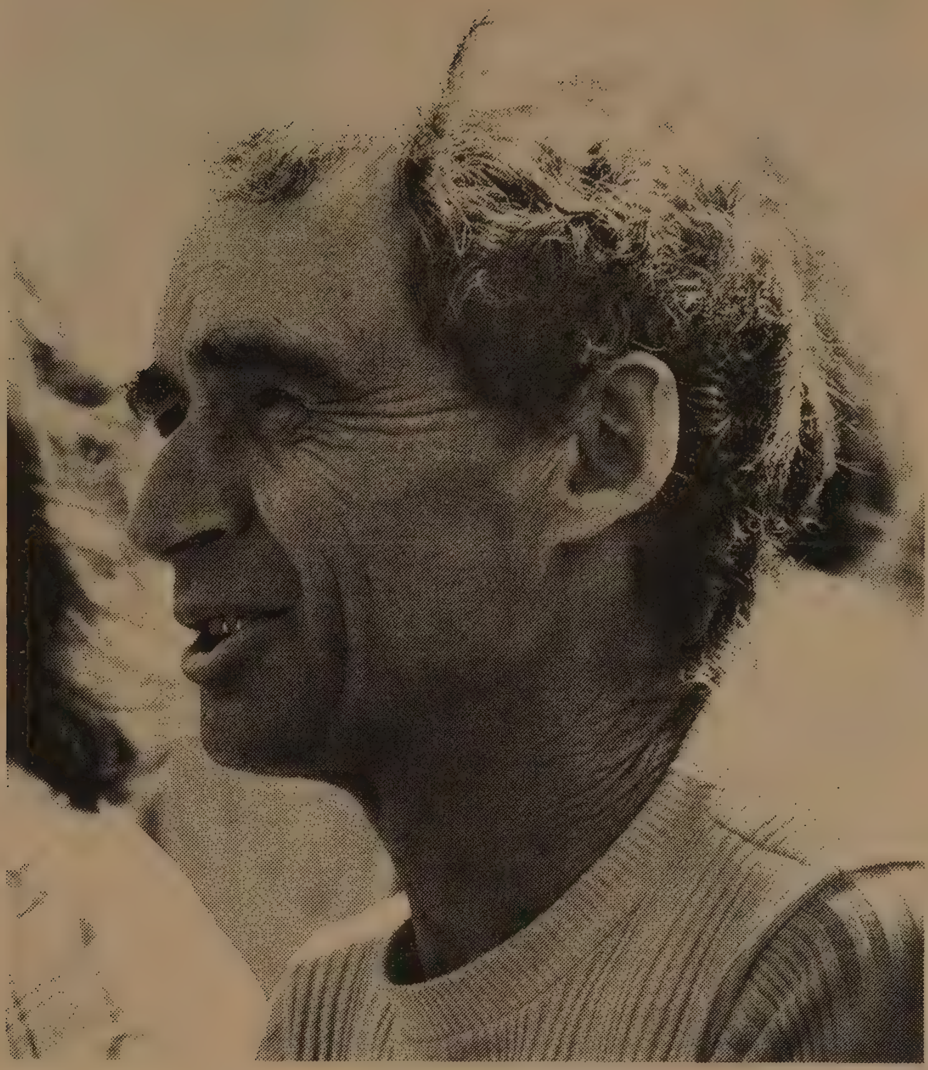
frugality vs. affluence
quality vs. quantity
complexity vs. elementarity
gathering vs. scattering
containment vs. diaspora
integration vs. segregation
smallness vs. gigantism
self-discipline vs. license
"religiosity" vs. materialism
technological reliance vs. technological mysticism
contract vs. homogenization
cooperation vs. confrontation
use vs. ownership
longevity vs. obsolescence
conservation vs. ecological naught
substance vs. shock
subtlety vs. sensationalism
self-reliance vs. dependence (drugs, etc.)
conviction vs. peer loyalty, mobsterism
transcendence vs. reductionism
humanism vs. personalism
universalism vs. nationalism
authority vs. power

In my view, true religiosity states, and bases its action on the belief, that it is more probable that the whole of the universe will animate itself than it is probable that that part of the universe which is animated will die. In view of the present as "we know it," such a statement, such religiosity, will appear as the emptiest of all conceivable boasts. It is, that notwithstanding, the only proposition where evil is reduced to naught since a fully animated universe signifies that the living has achieved that degree of pervasiveness and sacramentality which automatically precludes a parallel existence of non-life, that is to say, of fate. Thus, fate has transubstantiated itself into destiny (destination). "Under such conditions," the laws of mass energy would have ended their reality (usefulness), since the whole of mass energy would have transcended itself into logos. But then this transcendence is not a hypothesis or a future possibility. It is a daily occurrence. We, the humankind, are matter transcended into spirit; a raw, dark, violent, excess-prone spirit as yet.



The utopia of sectarian religion is the assumption that such a condition existed once, "At the beginning was the word," and that for unexplained, unexplainable reasons, such total plenitude had to be broken: imperfection as the offspring of perfection. Since this is an immense fall from grace, in fact an absurdity (the only true impossible), the "causal entity" for such fall must have always singled itself out as the most damnable of all possible (divine) realities, Lucifer, the Devil. Only the invention of the Devil could begin to justify the existence, the invention of God, since those actions unbecoming to God had to be the attributes of an "evil spirit," a son of God gone mad.

The Devil is that bottomless bag where one can find an explanation for every thing that faith cannot reflect upon its own God. If my theological, ecological bias is right the bag is even more capacious than the religious soul is capable of imagining. The bag is the universe in toto from which must be subtracted the "perfectable" speck of nothingness we call the living. "The Devil made me do it" means: what is bearing upon me outside and inside of myself is causing me not to be master of myself. I am a tiny god while at the same time I am an immense turmoil of brutishness, spanning "immense spaces" for "infinite times." Therefore, the Devil not only



Soleri

possesses me (I am lost within it), but I am the Devil itself which has somewhere in a remote corner of itself a tiny blink of divinity speaking, shouting out his (my) anguish.

Relativism says that the maggot is holiness in the flesh if the paragon is not what the corpses the maggot feeds upon were, but only if the paragon is that same matter the maggot is, subtracted of the living flame (morphology) which is the maggot's make-up. The maggot is therefore as a sublime ecstasy of matter made flesh, or otherwise as a dumb "pile" of isolated sub-atomic particles given to randomness. This is a measure of the anguish Lucifer, the universal maggot, is prey of. A "Prometheus" whose "most sublime thought" is to reach that platform of being where the devouring of the "dead flesh" is pure ecstasy; the ecstasy of perpetuating one instant longer the remote possibility of the divine through the sufferance of the evolutionary ladder. To my understanding, Lucifer is not then a fallen angel who "has lost grace" but a "maggot" in search of a condition of grace which is a possibility for its evolutionary progeny. We, the "super maggot" niched somewhere on the evolutionary ladder, in very close proximity to our "Father," the maggot God, must have a taste for a flesh which is a sublime flesh, the food of consciousness, and of the responsibility it carries with it. The frugal want to make sure that the ties to the maggot God are strong in the context of the past, but constantly cut and dissolved in the context of the future. We are as acrobats at the tip-top of the living pyramid and the apple we reach for is the apple we can create while resisting the call of the mermaids beneath us in the immense sea of Nirvana, the once all-powerful, all-inclusive, proto-living universe.

The lust for life is not to be found in the maggot-like ecstasy, the unselective gluttony of the mediocre, stated and willed. It is to be experienced as an emergence from the Red Sea of man's sufferance, cleansed of all those deposits which are the end product (mediocrity) of acquiescence to the call of our maggot ancestry.

Naturally, there are moments of history when gluttony is impossible. The temptation remaining, the possibility of satisfaction is remote. Those moments are in many ways precious and catalytic. They set the condition where necessity might translate itself into virtue, where the individual has to be in the melee persona prima, target and missile in one, a flying target seeking the heat of the thick of things because there is where the possibility of a magic leap into an unknown, higher grace lies.

Piety and frugality also do not stand for the same thing. Piety has a ring of resignation to it which frugality cannot endorse. It cannot since the true anguish of life is that which hurls itself against the indifference seeding each speck of matter as if its present battle "against" their unresponsiveness were the conclusive one. That makes each moment the magic moment, the key to deliverance and creation. In this unlimited "naivete," the world is "always new" as if the beholder were to acquaint himself with it for the first time. That is the state of being for creation.

Since the frugal (the lean) rubs the flesh against each of those particles of indifference, the frugal is, as stated earlier, a state where the tragic sense of life, this acknowledged anguish, is the bread and the wine for that hunger by which consciousness is possessed in its emergence. We are not butterflies sapping the sweet nectar of reality. We are still a "divine" metamorphosis of the hungry maggot. Capable of transforming "rotten" flesh into grace, the dead into the living.

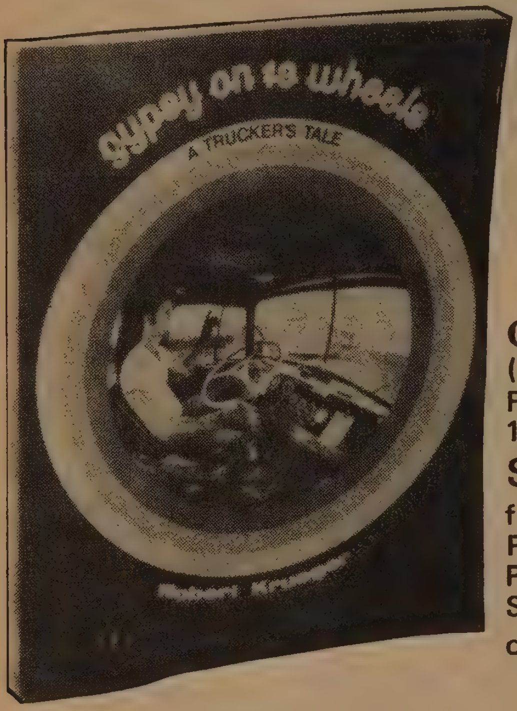
A vow of relative poverty is a recognizable statement of one's conscious choice within a socio-economic structure which equates happiness with affluence. If it lacks the fire that the cenobite and the seekers of god through wretched penance portray to us, it is, to say it once more, the belief that the flesh is part of the divine spirit, in fact it is the original tabernacle of it. It is earth saturated with expectation, the expectation of a grace beyond conjecture. ■

Nomadics

Gypsy on 18 Wheels

This is a book for those of us who aren't hogging 18 wheels under a hundred thousand bucks worth of truck down some fleabit twobit washout gravel lane loaded with cows and calves headed for greener pastures. It is a work of sociology, interviews with a book in mind, but filled with glorious pictures of the trucker at work, and the rig he rides. It is a work of art, of one volkswagon driver's fascination with the sailors on the concrete sea. As a book, it is tastefully executed. Makes me think that the editor snitched more than a handful of the Place Magazine style.

– J. D. Smith



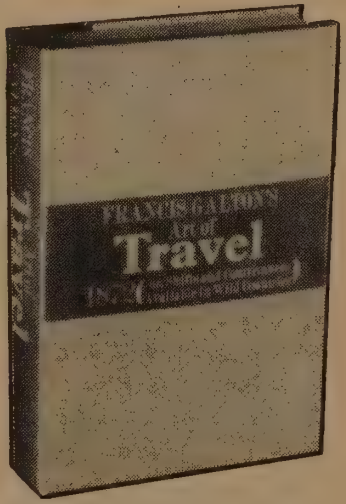
Gypsy on 18 Wheels
(A Trucker's Tale)
Robert Krueger
1975; 160pp.
$6.95 postpaid
from:
Praeger Publishers, Inc.
P.O. Box 1323
Springfield, MA 01101
or Whole Earth

Francis Galton's Art of Travel 1872

A fascinating guidebook by a classic Victorian explorer. Those who consider backpacking "roughing it" are deflated thoroughly when they read how the tough old adventurers survived. No down bags; you slept on your knees in a crouch to conserve heat in very cold weather . . . .

– J. Baldwin

Francis Galton's
Art of Travel 1872
(Or, Shifts and Contrivances
Available in Wild Countries)
Francis Galton
reissued 1971; 366pp.
$6.95 postpaid
from:
Stackpole Books
Harrisburg, PA 17105
or Whole Earth



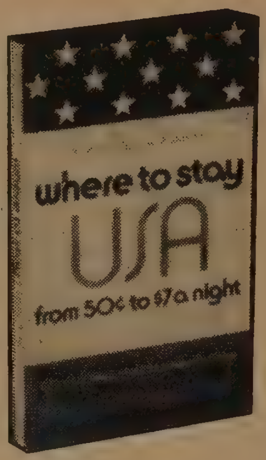
Bones. – Another remarkable substitute for firewood is bones; a fact which Mr. Darwin was, I believe, the first to mention. The bones of an animal, when freshly killed, make good fuel; and even those of cooked meat, and such as have been exposed to the air for some days, will greatly increase the heat of a scanty fire. Their smell is not disagreeable: it is simply that of roast or burnt meat. In the Falkland Islands, where firewood is scarce, it is not unusual to cook part of the meat of a slaughtered bull with its own bones. When the fire is once started with a few sticks, it burns well and hotly. The flame of course depends on the fat within the bones, and therefore the fatter the animal the better the fire. During the Russian campaign in 1829, the troops suffered so severely from cold at Adrianople, that the cemeteries were ransacked for bones for fuel.

Where To Stay USA from 50¢ to $7 a night

Just that.

– J. Baldwin

Where To Stay USA
from 50¢ to $7 a Night
Marjorie Cohen for Council
On International Educational
Exchange
1974; 240pp.
$2.50 postpaid
from:
Simon and Schuster
One W. 39th St.
New York, NY 10018
Attn: Order Dept.
or Whole Earth



Bisbee, Arizona

Accommodation: Bisbee YWCA Youth Hostel (AYH), Box 968, 26 Howell Avenue, 85603. Eight miles from the Mexican border. Telephone: (602) 432-3542. Open year round. $1.50.

Budget motels

A directory of chain motels in the U.S. that cost $7.50 -$10 a night.

– SB

1975 National Directory
of Budget Motels
(A Nation-Wide Guide To
Over 700 Low-Cost Chain
Motel Accommodations)
Raymond Carlson, ed.

$2.50 postpaid
from:
Pilot Books
347 5th Ave.
New York, NY 10016

Truck Stop Men's Room

Here I sit with a
broken heart,
Took my last little pill,
now my truck won't start.

Start truck first, Then take
Pill, Dummy!

If your pills
were worth a fuck,
You'd go out
and pull your truck.

– Sequence of graffiti seen at the 4-WAY TRUCK STOP, Wells, Nevada

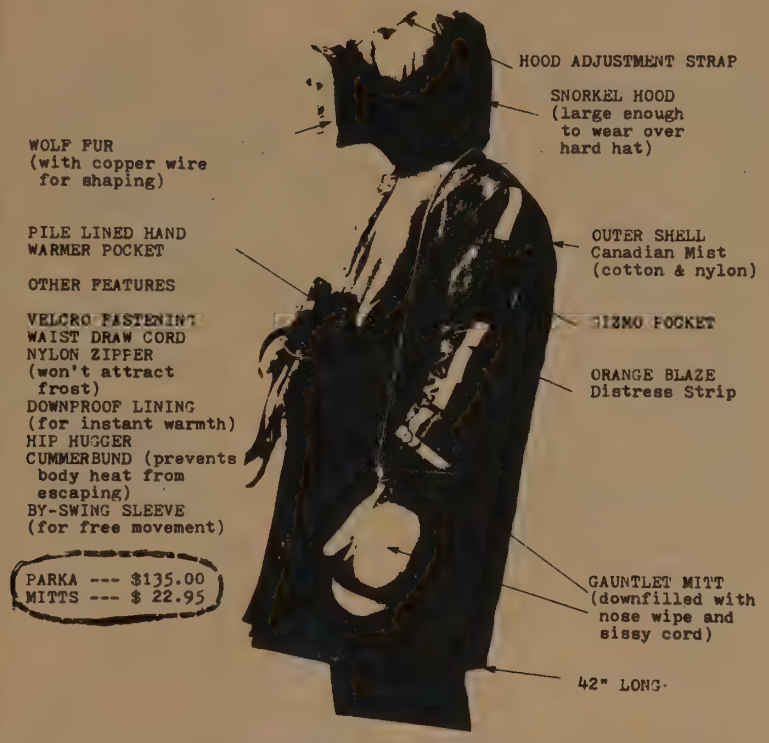
Crown Surplus Store

Crown Surplus Store, Calgary has a catalog for a buck. Mostly US & Canadian army surplus, also some British stuff. Specializes in swords, armour etc. but has everything from kilts (the REAL thing) to French army sheepskin coats to Hispano-War belt buckles. Suit of armour? Anti aircraft gun?

— Andi Ray Bartnek-Lewis
Calgary, Alta., Canada

Catalogue #4
(Genuine Gov't. Surplus)
$1.00

from:
Crown Surplus Stores Ltd.
1005 - 11th St., S.E.
Calgary, Alberta
Canada T2G 3E9


HOOD ADJUSTMENT STRAP
SNORKEL HOOD (large enough to wear over hard hat)
WOLF FUR (with copper wire for shaping)
PILE LINED HAND WARMER POCKET
OTHER FEATURES
VELCRO FASTENING
WAIST DRAW CORD
NYLON ZIPPER (won't attract frost)
DOWNPROOF LINING (for instant warmth)
HIP HUGGER CUMMERBUND (prevents body heat from escaping)
BY-SWING SLEEVE (for free movement)
OUTER SHELL Canadian Mist (cotton & nylon)
GIZMO POCKET
ORANGE BLAZE Distress Strip
PARKA --- $135.00
MITTS --- $ 22.95
GAUNTLET MITT (downfilled with nose wipe and sissy cord)
42" LONG

Our parkas are constructed from water fowl down and cotton. Down because it is still the warmest insulation available and cotton to allow the parka to "breath".

The original oilmens parka

Backpacking Equipment

Generally sound advice backed by some pretty subjective judgment. (Sleeping bags, for instance, are not tested with instruments for heat retention and some brand names are not included.) All in all a good way to cut through the ridiculous claims and counterclaims made by an increasing population of manufacturers. There's a good chapter on the polyester filled bags which are so much better suited than down to many camping situations. The critique of "freeze-dried" food (much of which isn't freeze dried) should save you the price of the book.

— J. Baldwin

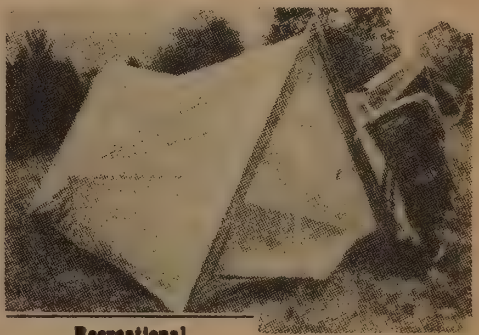
Backpacking Equipment
(A Consumer's Guide)
William Kemsley, Jr. and
Backpacker Magazine
1975; 160pp.
$4.95 postpaid
from:
Macmillan Pub. Co., Inc.
Order Dept.
Front & Brown Streets
Riverside, NJ 08075
or Whole Earth

The dimensions of the REI HI-ENDER are nearly identical to those of the North Face Sierra. The catenary cut isn't as extreme, the coated nylon taffeta floor doesn't extend up the sides, and the detailing isn't as nice. But it costs a lot less. It is a high-performance tent designed with some compromises because of economy. Probably the most serious compromise is the lack of a zipper across the bottom of the mosquito netting. There's a yawning gap there, so anything interested could walk right in.

The REI Hi-Ender is a fine tent in a wind and rode out three thunderstorms admirably, staying dry, cool and comfortable . . . .

Rating
System

★★★★★	Excellent quality
★★★★	High quality
★★★	Good, efficient
★★	Serviceable
★	Doubtful
✓✓✓	Excellent value-for-money
✓✓	Good value-for-money
✓	Average value-for-money
(no check)	There is better for the money



Recreational Equipment, Inc.
Hi-Ender
★★★★✓✓✓

Furthurmore

Dear Stewart:

That was a very nice blurb you gave Furthur *[Spring 75 CQ]* (we did eventually change the spelling of the name. In Mexico, the citizens thought upon first glance, the word was Fuhrer, that we were Germans, perhaps Nazis on the lam, and we quickly repainted it: Further.). Hagen has put together a plan involving N.B.C. TV, the bicentennial commission, a Grateful Dead concert, a cross-country Furthur tour, and an hour-long TV special that will not only get the bus to the Smithsonian but will produce a grandiose sum of money to be split up — I believe he was thinking in the area of $500,000. I thought it a bit far-fetched but Faye tells me he is actually submitting the plan to the Smithsonian. Kesey and I were thinking more of raising a modest couple grand to get the bus running, repainted and on its way East.

Gretch and I are planning to move onto our property this summer if we can get together facilities for eating and cooking and pooping and washing, plus living quarters for eight kids, twenty chickens, two cows, dog, cats, rabbits. The pigs are already there in a plain pen.

I've been working on the old bus movie too, trying to get portions into viewable shape. A one-hour slop print of the beginnings of the trip is making modest showings about the country after a week's booking at the Whitney museum in New York that raised a flurry of interest. It's too rough a print to rent out to theaters. I'm attempting to get some money together to improve its quality and have a couple of rentable prints made. I can come up with an optical sound, one-hour, print for eight hundred dollars if you know anyone that would like to put up the money. In return I will let the backer show or distribute the film until the $800.00 is made back; then we can discuss whether to let me distribute the print or let someone else. I have the slop print to show to anyone who might be interested so the person could get an idea what the first hour is like.

my (**Obs. From the Treadmill**) is editing an issue of Spit In The Ocean dedicated to Saul Alinsky with the theme: Getting there from here. I'll enclose a blurb describing my's plan. Looks like the issue will be ready to go in May.

Timothy Leary is also ready to get to work on his issue which gets us off wondering what's happened to him to wondering how to get the material together for his issue. We'll probably begin sending out requests for manuscripts this week.

Sunny today. Been cold all spring, time for a change so we can get serious outdoors. Later, Stew. Take care.

— Babbs
Dexter, Oregon

Bicycling Science

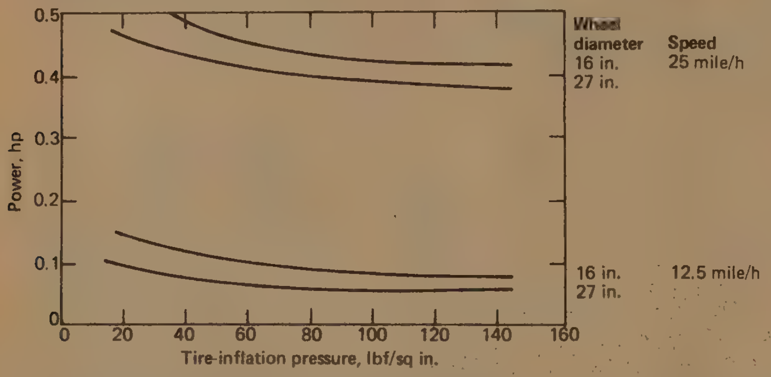
The human being used as an engine may not be the way you look at a bicycle, but that's how nature looks at it. This exceptional book analyzes, compares and judges the measurable aspects of people-power and the bicycle being ridden. Did you know that a loosely flapping shirt can add 30% to your air drag?; that the radical designs featuring a rider low down with a backrest aren't as efficient as traditional frames?; that until a grade is 15% you use less energy riding up than pushing the bike? The authors are engineers and have performed exhaustive tests to back their graphs and conclusions. Happily, they haven't hidden the findings in a mass of jargon. The chapter on bicycle physics will get most readers to a useful level of understanding. The chapter on people-powered devices other than bicycles is fascinating; there's even a lawnmower!

Sharp editing and careful research have made this book expensive, but it's likely worth it to those bicyclists wishing to know what they are talking about. It's sure to stir controversy, and equally sure to result in better bicycles.

— J. Baldwin

Bicycling Science
(Ergonomics and Mechanics)
Frank Rowland Whitt &
David Gordon Wilson
1974; 247pp.
$12.95 postpaid
from:
MIT Press
28 Carleton Street
Cambridge, MA 02142
or Whole Earth

Figure 6.6
Effect of tire pressure and wheel diameter on propulsive power required for bicycles. Note the diminished rate of decrease of power required at pressures above 75 lbf/sq in., the manufacturer's recommended pressure.

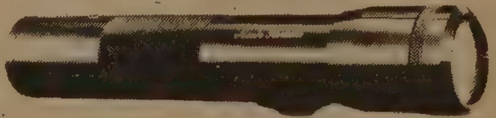


These calculations have been drawn up to show the calculated quantitative effect of the use of different tire pressures and wheel diameters on the power needed for riding on very good roads. It is obvious that the smaller wheels are "slower" over the whole range of speeds, and to an appreciable extent at the lower speeds. (If rougher roads had been assumed for the calculation, the "slowness" would have been more apparent — unless the wheels were assumed to be incorporated in a sprung, damped suspension, when they can be superior.)

Safarilite

If any of your readers have a requirement for a flashlight that is as close to indestructible as can reasonably be expected, they should look at the line of "Safarilites". The ads aren't hype; everything about these lights is top quality for durability and permanence. I have had mine for well over a year and it has taken falls that would have dented the body of an ordinary light or broken the lens with hardly a mark. They are expensive but probably cheaper in the long run than buying a new light every few years.

Safariland
1941 Walker Avenue
Monrovia, CA 91016



The three cell 'C' model is also available from Brookstone (CATALOG p. 142).

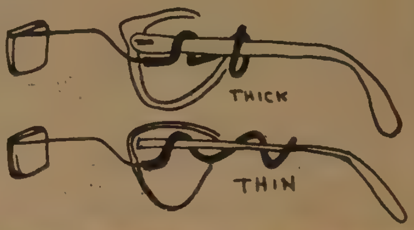
— John McPherson
Houston, Texas

The Touring Cyclist Shop

These nice people make what many agree to be the best panniers available. The clever design easily converts into a suitcase, a shoulder bag, or can be clamped to a packframe for hiking. TC also makes a tiny rearview mirror that clamps to your eyeglasses. They have other goodies too, and reputedly give exceptionally good service.

— J. Baldwin
[Suggested by Jerry Ryan]

Catalog
Free
The Touring Cyclist Shop
P.O. Box 4009
Boulder, CO 80302



Panniers $48.50 postpaid

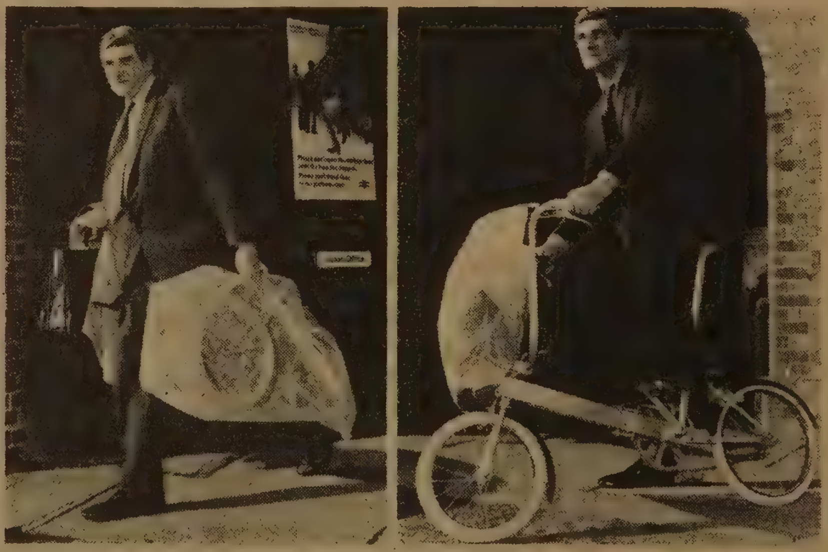
Portable bicycle

The Bickerton bike looks to be the ultimate so far in folding bicycles. It weighs 18 lbs. and unfolds in 60 seconds. With Sturmey-Archer 3-speed you add two pounds weight and 10£ cost.

— SB

Bickerton Portable Bicycle
£114 (about $250)
Standard single-speed

from:
H. Bickerton Ltd.
Mimram House
Tewin Water
Welwyn, Herts
England

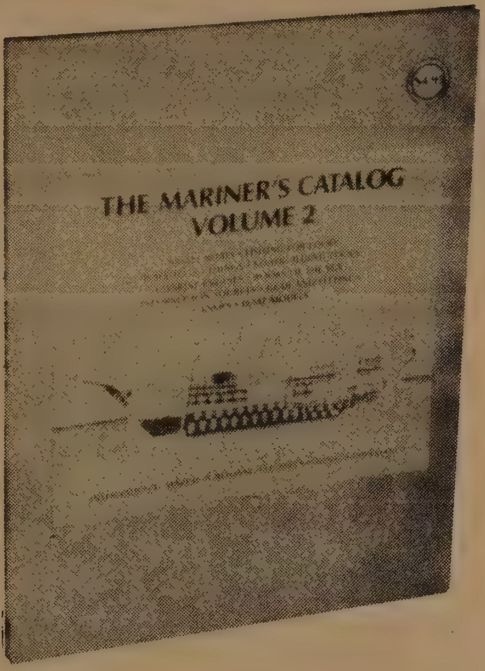


The Mariner's Catalog — Vol. 2

Surpasses **Whole Earth Epilog** *on evaluation and access to gear and techniques for water-going. Also supplements and improves on their Vol. 1 (EPILOG p. 652).*

— SB

The Mariner's Catalog —Volume 2
David R. Getchell, ed.
1974; 179pp.
$4.95 postpaid
from:
International Marine Pub. Co.
21 Elm Street
Camden, ME 04843
or Whole Earth



$6.25

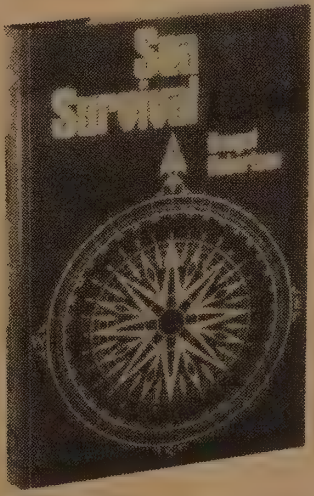
For grinding and sanding operations, goggles are a must. Most people hate goggles because they fog up so readily, but there are a few fog-resistant types that are very useful. American Optical has a model No. 705 Super Vent Goggle which also protects from dust or vapor penetration by utilizing a nosepiece respirator that is part of the unit. It is certainly a best buy in this type of equipment, for it's a respirator-and-goggles in one inexpensive unit that won't fog even in hot, humid weather. Because this unit is so efficient, I don't use a separate respirator, and can't really recommend one.

Sea Survival

Written by a man whose schooner was sunk in one minute by a killer whale 1000 miles offshore, so he should know. Has a lot in it I didn't know. Example: had you thought that a tube leak in a raft inflated with CO_2 could asphixiate you under a canopy? The book is written with a positive attitude and includes, in addition to the expected information and emergency gear lists, a set of maps. These are excellent for other uses as well as survival, as they indicate inhabited shores, shipping lanes, density of marine life, and frequency of tropical storms. You should probably have this aboard in the liferaft.

— J. Baldwin

Sea Survival
(A Manual)
Dougal Robertson
1975; 148pp.
$15.00 postpaid
(remember the maps)
from:
Praeger Publishers, Inc.
P.O. Box 1323
Springfield, MA 01101
or Whole Earth



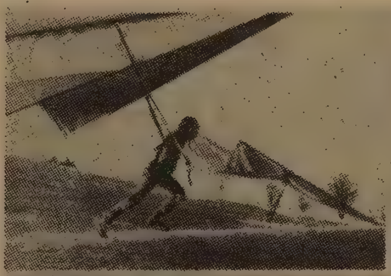
Foul water which is not poisonous but may cause vomiting can be absorbed rectally by means of a water retention enema. In rain storms, when all containers have been filled, additional water may also be taken in this way not only in order speedily to relieve dehydration but also as an additional method of conserving surplus water, for when the stomach shrinks in survival conditions, it is unable to hold much water. Up to a pint of water may be taken and absorbed through the rectal membrane, but it must be remembered that salt water taken in this way is equally as dangerous as if taken by mouth.

Fly

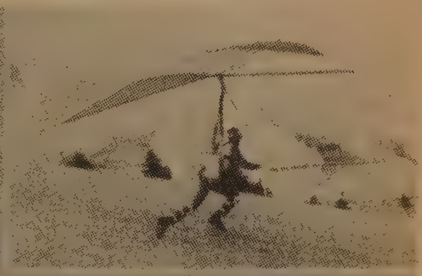
The only book on hang-gliding that shows you in photographic detail HOW to take off, maneuver, and land. It's a bit gaudy and false-romantic, but its thoroughness beats out Poynter's **Hang Gliding** *(EPILOG p. 645).*

— SB

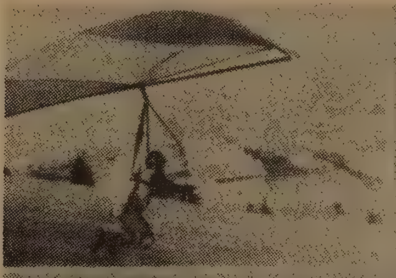
Fly: The Complete Book of Sky Sailing
Rick Carrier
1974; 128pp.
$7.95 postpaid
from:
McGraw-Hill Book Co.
c/o Trade Order
Service Dept.
Princeton Road
Highstown, NJ 08520
or Whole Earth



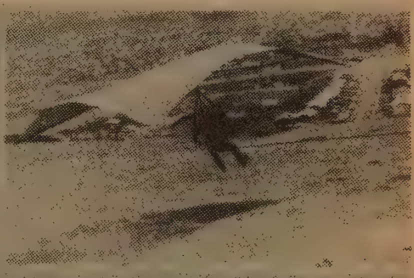
Lay down the shoe leather hard. Keep the nose attack angle constant. Keep moving. Take one or two additional steps after you think you are about to lift off.



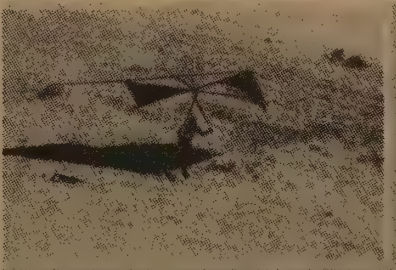
Suddenly you find that you are airborne. Do not anticipate the lift off by jumping into the air. Keep your feet going until there is nothing for them to step on.



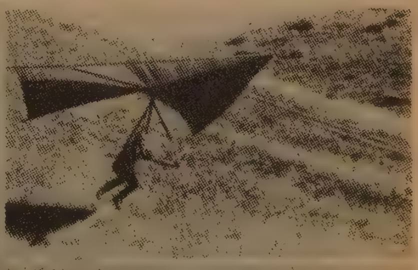
Tuck up your feet and keep the nose angle up, but do not push it out any further.



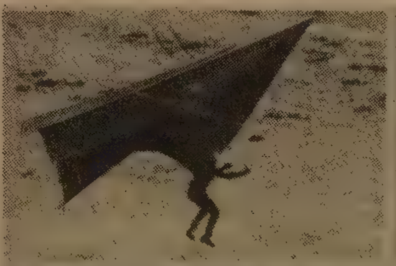
Anticipate your landing. Lower your feet and start to push on the control bar to raise the nose into a flare. Always unhook the harness after every landing.



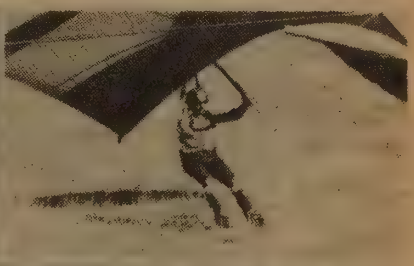
Here is another example of a successful first flight. The student starts a fast run down the slope. Sail is level with the horizon or the wind, not with the slope.



He feels the lift as the harness straps tighten, and then he pushes out the control bar and is up in the air. Look for your landing area and start to flare.



He holds the sail in the flare position and prepares to land.

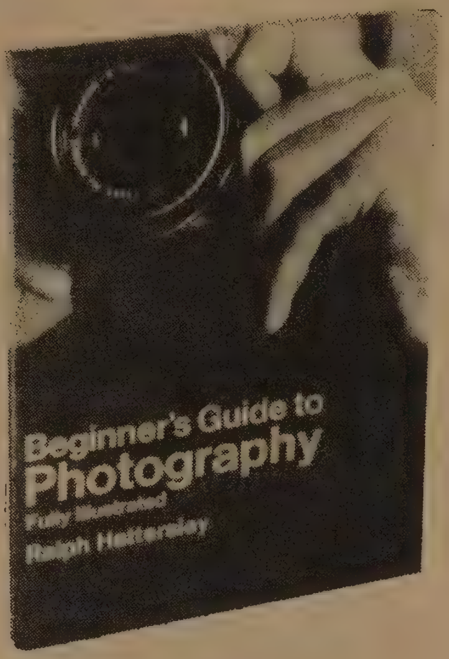


With the sail flared, all forward movement will stop and you touch down at zero speed.

Beginner's Guide to Photography

Hattersley has the intelligence and talent usually absent from beginner's books. (I remember it was his nude close-ups of a black man and white lady that did in Eros *magazine.) The book strides easily through the fundamentals to arrive at the discipline of fine technique, especially of light.*

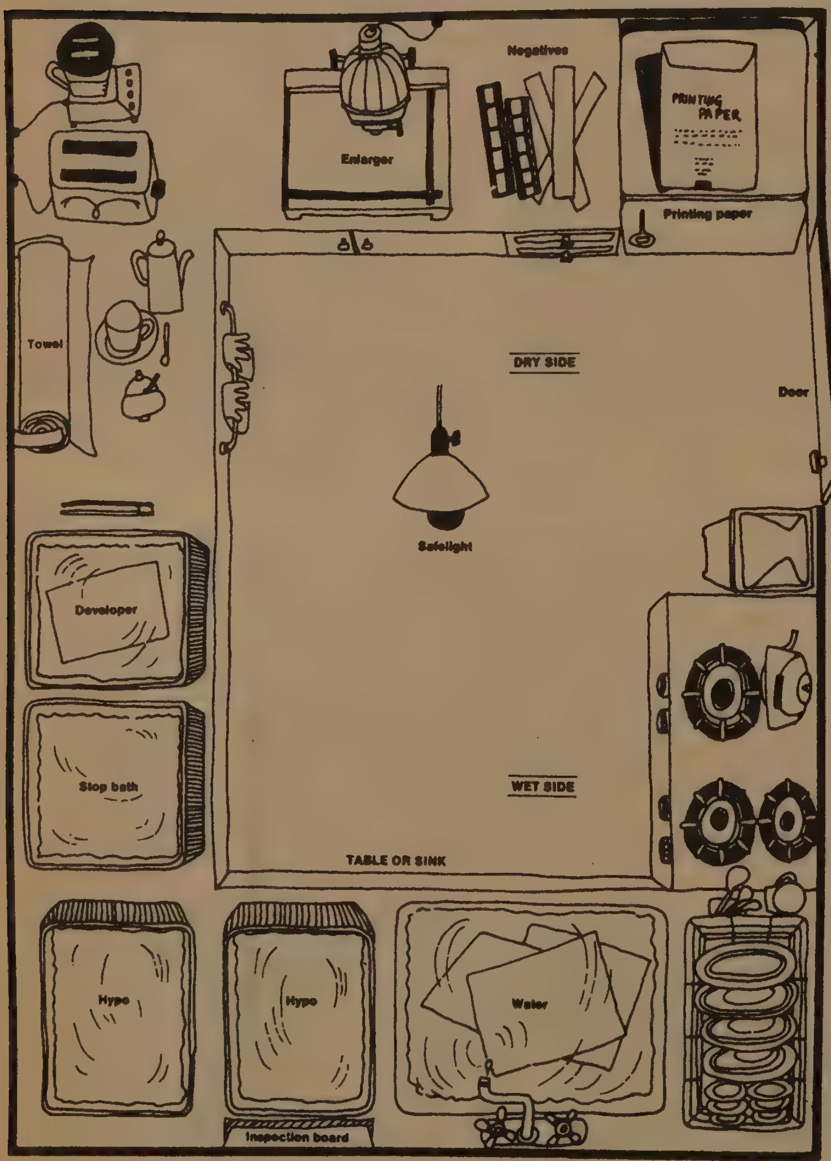
— SB



Beginner's Guide to Photography
Ralph Hattersley
1970, 1974; 149pp.

$7.95 postpaid

from:
Doubleday and Company, Inc.
501 Franklin Avenue
Garden City, L.I., NY 11530
or Whole Earth



Kitchen darkroom

The Money Saver's Guide to Photography

Here's advice for the penny-pinching photographer who is willing to expend the effort necessary to reduce costs while maintaining quality. Zielinski recommends shopping procedures — where to find bargains through ads, mail-order houses, and secondhand marketplaces; how to appraise and test purchases. He explains his own equipment adaptations and inventions to demonstrate how substitutes can be made for expensive gadgetry. Zielinski's money-saving wisdom, given in a reassuring anecdotal style, effectively counteracts the advertising-cultivated compulsion to acquire the latest in photographic technology regardless of cost. The book itself is a bargain at twice the price.

— Diana Fairbanks

The Money Saver's Guide to Photography
John M. Zielinski
1973; 72pp.

$2.25 postpaid

from:
Photo-Art Enterprises, Inc.
105 B Avenue
Kalona, IA 52247

Kodak puts out a wide variety of books to help the photographer, but none I think is of more help in a smaller package than **Kodak Master Photoguide AR-21.** It is a mini-encyclopedia of all pertinent data on films, exposures, filters, lighting, etc.

●

The list price of a camera can often be far removed from the actual selling price. It is possible for a camera to list for $220 and actually sell in many of the larger mail order camera markets for as little as $120.

Film

1) Photographic Film: **Eastman Color 5254 or 5247**

A motion picture film that can be loaded into cassettes for still use or bought pre-loaded. I buy short-ends (good left-over studio film) from:

Studio Film Exchange
11555 Ventura Blvd.
No. Hollywood, CA 91604
(213) 985-3303

and bulk load it myself. It can be purchased from and processed by

RGB
816 No. Highland
Hollywood, CA 90038

I've tried about 6 other of the labs that process it. None gave me the quality, price, or service of RGB. Oh! This is a fine quality color negative film. You can buy it, have it developed, or developed and mounted slides made cheaply. But it doesn't compare to the "King" Kodachrome 25.

Kodachrome 25 with processing (Kodak Mailer) can be purchased from:

Adray's
1705 N. Chapman
Orange, CA 92666
(213) 587-7254

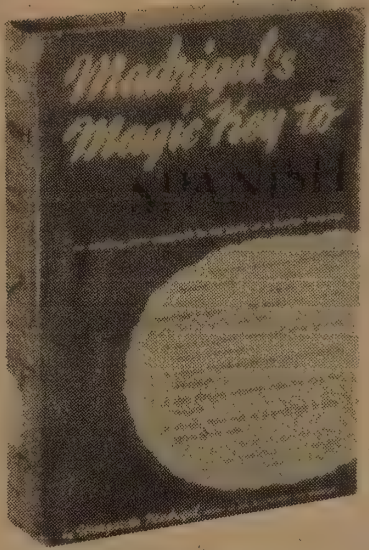
[more →]

Madrigal's Magic Key to Spanish

How to guess your way through Spanish. This very thorough textbook tells you how to change most of the words you already know into Spanish — the rules are simple and consistent. Correct Spanish word-order is regularly reinforced by translation into incorrect English ("to me he delivered the book"). Exceptions to rules are dealt with unhysterically. At the end is a compilation of common Spanish expressions and a good vocabulario. An address is given when one can send for records to complete the immersion.

Madrigal's style of instruction is breezy and beguiling, belying the great volume of vocabulary you gain right away (over 450 words in the first chapter). With the panic of speechlessness out of the way, the rest is almost easy.

— Sally Nicholson



Madrigal's Magic Key to Spanish
Margarita Madrigal
1951, 1953; 496pp.
$7.95 postpaid
from:
Doubleday & Co., Inc.
501 Franklin Avenue
Garden City, L.I., NY 11530
or Whole Earth

Note: if pronouns seem at all complicated to you, don't worry about them. In fact, forget you ever heard of them. They will come up so often in future lessons that before you know it you will be using them automatically.

•

Remember that if a word ends in "tion" in English, change the "t" to "c" and, presto, you have a Spanish word.

TION = CIÓN
the nation = la nación

"La" means "the"; "una" means "a, an."

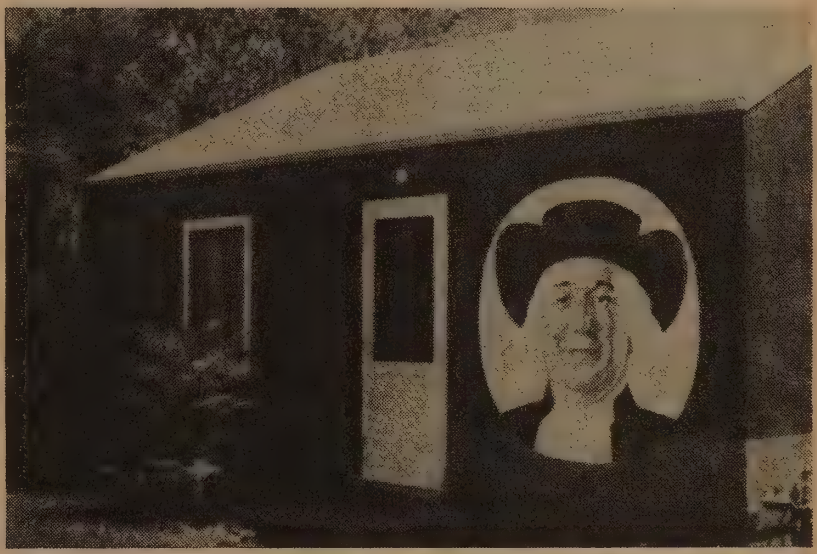
la información	una invitación
la constitución	una institución
la operación	una indicación
la preparación	una composición

Street Art

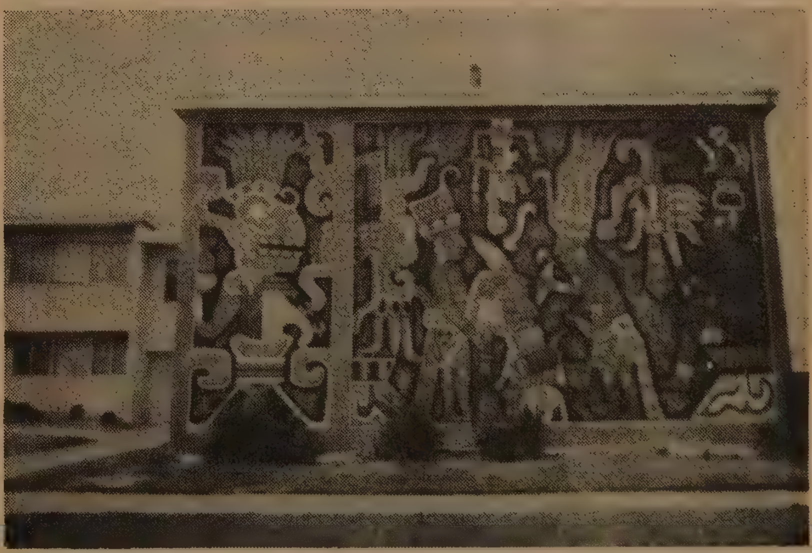
Although it's peoples' art at publishers' prices, it's worth having as the quintessential sightseeing tour book for places like L.A. and Chicago. Great photos of street feats, everything from Hog Heaven, the longest mural in the world (at Farmer Johns Sausage Factory in L.A.) to the 25 ft. third world paratrooper descending on the state capitol in Sacramento. The best bibliography I've seen on the phenomenon, too. The walls belong to the people: like Sommer says, Culture is too important to be left to the "experts."

— Jeanne Campbell

Street Art
Robert Sommer
1975; 150pp.
$7.95 postpaid
from:
Link Books
A Division of
Music Sales Corp.
33 West 60th Street
New York, NY 10023
or Whole Earth



Quaker Oats Man painted as a lark by Mike Barton, an unemployed house painter, Sacramento, California.



Wall, Estrada Courts Housing Project, Los Angeles. Coordinated by self-taught Chicano artist C. W. Felix, 1973.

$5.29 for 36 exp. (best price I've been able to find on either side of the Rockies).

From the slides you can have the most beautiful and most permanent prints made on Cibachrome. Several labs are doing it, but I like

Hollywood Custom Photo Labs
3715 Cahuenga Blvd. West
No. Hollywood, CA 91604

For making the slides, or any film for that matter, scratch resistant, fungus resistant, just more permanent in general,

Vacuumate Corporation
207 W. 25th Street
New York, NY 10001

has an internal-film-moisture-replaced-with-resin process.

Hybadye and Etchadine are two new patented retouch systems for photo retouch or black and white coloring. They are far superior to either water color methods or oil coloring methods. They are available from:

Jamieson Products Co.
9341 Peninsula Drive.
Dallas, TX 75218

— Paul C. Anacker
Woodland Hills, California

The Use and Training of the Human Voice

Everything you need to understand, train, improve and enjoy your voice is here in this wonderful book. Lessac's method is uncomplicated and precise . . . a basic system for actors, speakers, singers, everyone who uses the voice as an instrument beyond simple communication.

One of the best features of Lessac's approach is the way he relates the voice to general health and the total person. Many people who never get near a stage or a microphone can use the book to make real gains in self-awareness and well-being.

Best of all, perhaps, the book is designed for self-teaching. It takes nothing for granted, but exposes every vital aspect of the use and training of the voice.

— Scott Beach

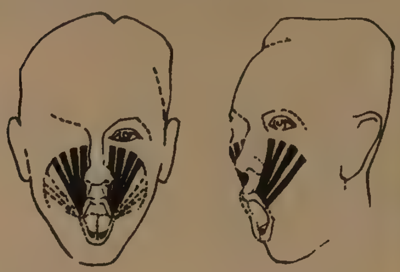
•

I found that when consonants were felt as vibratory and tactile combinations of action and sensation associated with orchestral instruments, muscle and vibration memory were developed, and the ear was deemphasized as a controlling guide — the student learned to feel the sounds instead of listening for them . . .

Loss of intelligibility in speech is largely due to the loss of final consonants and those that precede other consonants; yet if they are conceived as orchestral instruments played and felt effortlessly, they come easily. Consonants experienced in this manner not only preserve intelligibility but reveal the inexhaustible variety inherent in the structure of English words — in their contrasting rhythmic patterns, sustained tonal colors, and melodic qualities. For example:

When the word *characteristic* is spoken with the C's felt as light, tapping drumbeats and the S as a sustained sound effect, it takes on new rhythm and a new quality of expression. The same principle applies to words like *environment, incestuous, demand, questioned, contract,* and *scientists.*

Triangular patches of muscle that help form the inverted megaphone shape.



The Use and Training of the Human Voice
(A Practical Approach to Speech and Voice Dynamics)
Arthur Lessac
$8.00 postpaid
from:
DBS Publications, Inc.
150 West 52nd Street
New York, NY 10016
or Whole Earth

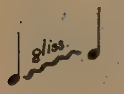
New Music Vocabulary

Notating the ineffable — symbols for all the nuancing besides notes that goes on between the musician, the instrument, and the music.

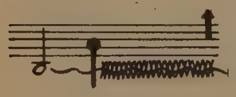
Why not do something similar with fiction? Or with printed interviews? Or toy instructions?

This is a well-taken step forward back toward hieroglyphics.

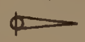
— SB



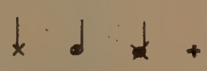
A chromatic or articulated gliss, as opposed to the smooth gliss of a string instrument.



Strike the already vibrating string with the indicated mallet. Cease striking at the arrow.



Hold the tone until a breath is expired.

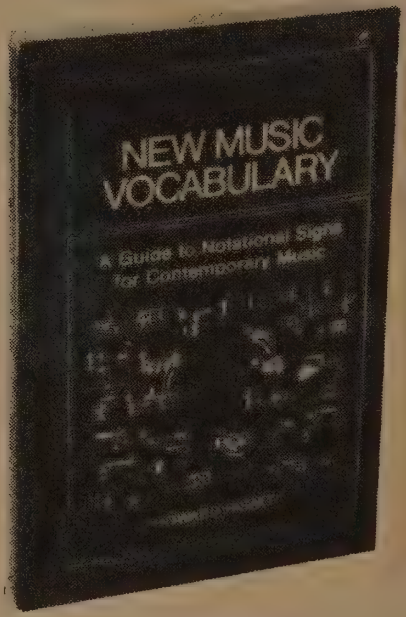


Blow without producing a tone (air current noise).

WHAT

Hollow letters or words indicate whispering.

New Music Vocabulary
(A Guide to Notational Signs for Contemporary Music)
Howard Risatti
1975; 218pp.
$5.45 postpaid
from:
University of Illinois Press
Urbana, IL 61801



Discwasher

The best record-cleaner. The price is substantial, but the difference Discwasher makes is easily worth it. All my old records sound better than new, so I'm listening to them again.

— SB

Discwasher
$14.95 postpaid

from:
Warehouse Sound Co.
P.O. Box S, Railroad Square
San Luis Obispo, CA 93405
or most hi-fi stores

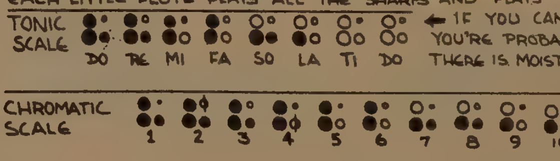
Little Flute

Sure-fire way to delight strangers. They ask, "What's that little pendant got holes in it for?" And you say "For music," and whip into "This Land Is Your Land." Unusually nifty item.

— SB
[Suggested by Scott Beach and Jim Land]

Little Flute
(polyester resin)
$10 postpaid
(silver or gold cost more)
from:
Little Flutes
P.O. Box 417
Austin, TX 78767

EACH LITTLE FLUTE PLAYS ALL THE SHARPS AND FLATS IN ONE OCTAVE!

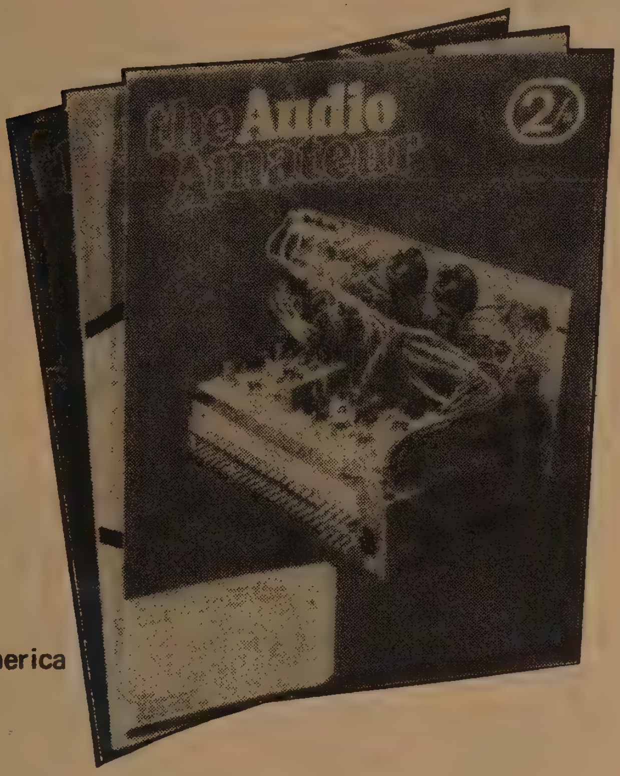


← IF YOU CAN'T PLAY THE LAST 3 NOTES YOU'RE PROBABLY BLOWING TOO HARD OR THERE IS MOISTURE IN THE WINDTUNNEL.

Audio Amateur

The hifi pioneers of the 50's (guys who built their houses with the living room wall a giant exponential horn, the speaker buried in a 55-gallon steel drum — 1953-4 **Audio** *magazines are a real treat) became the stereo component manufacturers of the 60's responsible for the full-color-ad brochures that masquerade as audio-hobby magazines of the 70's. In diametric opposition to this herd is* **Audio Amateur,** *dedicated to enticing us to build rather than consume, to experiment enjoy learn grow, to write articles for the magazine (I'm in the middle of writing a series on electronic music system for live performance). Maximum pleasure for minimum $, to help us thru the 25-year depression.*

— Larry Greisel



Audio Amateur Magazine
Edward T. Dell, Jr., ed.
$7/yr.
(quarterly)
from:
Audio Amateur
P. O. Box 30
Swarthmore, PA
19081

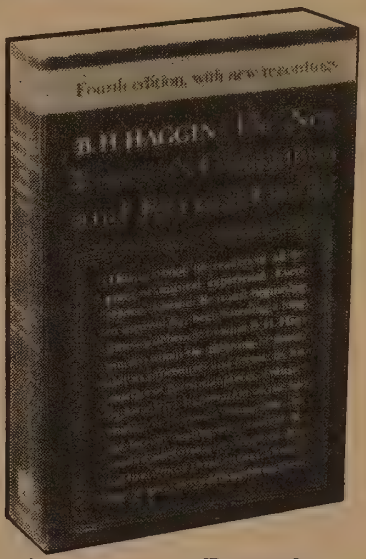
Catalog Free
from:
Electro Value America
P. O. Box 27
Swarthmore, PA
19081

Although we do not acknowledge the connection, the magazine operates two wholly owned subsidiaries for the benefit of its readers. One of these, Old Colony Sound Lab, offers etched circuit boards, kits of parts for the projects in the magazine, and books of various publishers to readers. We also operate a subsidiary called Electro-Value America which is an importing enterprise distributing electronic parts from a London firm, Electro Value Ltd.

The New Listener's Companion and Record Guide

Make no mistake, this is not the book for a casual listener — someone who thinks that a counter-tenor is a singing soda jerk and that largo is an island off the coast of Florida. B.H. Haggin assumes that his readers share his love of classical music and are interested in developing critical insight. He begins with musical procedures and forms, explaining the development of form in sound — the ways in which sound conveys thought. He analyzes selected pieces, using prose and musical notation. Next is a survey of the literature of music and chapters on performance and criticism. The second part of the book is a guide to recorded performances of the music discussed in the survey. Recordings are evaluated on the basis of quality of performance and sound reproduction. The list has been updated to include recordings issued through 1973. Haggin's critical judgments are well-reasoned, well-written and all-pervasive — an open invitation to listen and form your own opinions. If that doesn't tempt you, at least you'll know that contrapuntal procedure isn't football jargon for a 4th down defensive maneuver.

— Diana Fairbanks



The New Listener's Companion and Record Guide
B. H. Haggin
1974; 399pp.
$4.95 postpaid
from:
Horizon Press
156 Fifth Avenue
New York, NY 10010
or Whole Earth

ROSSINI

(The) Barber of Seville. The performance on Deutsche Grammophon 2709-041 is made outstanding by the singing of Berganza and Alva, with its enchantingly swift and light and pointed-up delivery of florid passages (which Alva did not achieve in the earlier performance with De los Angeles); and by the similar pointed-up lightness, and withal the cohesive tension, of the orchestral context that Abbado provides with the London Symphony.

(La) Cenerentola. The similarly outstanding performance of this work with Berganza, Alva and Abbado, on Deutsche Grammophon 2709-039, surpasses the 1953 performance conducted by Gui that I expected never to hear equalled.

Letter

[This letter received by Emory University Family Planning Program. Sent to us by Felicia Guest.]

Sir,

Subject Review Copies

This is my approach in continuation with all requests for review copies of your indispensable books valuable timely major publications all in common cause mutual interests to merit your business interests too in the country today as never before through me also all in international interests informations and understandings as well all for causes so genuine noble and national so to say your vast country well-reputed from time immemorial for the same.

If I have contributed worth your estimation and outlook towards your international interests causes goals aims objects and purposes in view I am sure there cannot be any hitch and hesitations in arranging their despatches to this end one copy of each paper-backs will do and suffice subject to your final choice approval and selection relevant to this country and elsewhere. Even word of mouth advertising to conciseness and clarity has a meaning of far-reaching consequences all in your interests too resultantly and conclusively. Full credit must accompany the reproductions I believe in I take liberty to express.

My motto has ever been adequate appropriate due deserving and desired publicity and promotion of them here in the country today as never before.

Again I dare assure you that all possible vital varied vigorous comments all purposeful profound popular comments & review comments will be offered in your as well as mine interests.

May I as such under the circumstances hope to look for a chance to enable me to prove prove what I am worth in the directions.

May I also expect to be added to your Mailing Lists so far their despatches to this end are concerned.

Clippings of published reviews in duplicate will follow your address as usual.

A copy of your latest catalog of books publications plus your list of books in print to date is also requested requested.

Written with a sincere desire to be of service

Looking ahead

With all regards and respects to you I am Sincerely Yours,

(P.N. Singh) M.A.
Journalist
India

"REALITY" and REDUNDANCY

BY GREGORY BATESON

Correlative
Analogic
Digital
Iconic
Ostensive
Evolutionary
Holographic

REALITY

This word is so loaded with ambiguity and *double entendre* as to be useless except as an interesting example of linguistic and epistemological decay. If "reality" were simply the set of all that is, the "unreal" would be a harmless epithet for the null set. But alas, "reality" still carries the smell of its derivation from the root of the Latin *res* (=thing). If this were all, "reality" could mean "thingishness". But, again alas, along with that simple denotative meaning, there goes a connotative suggestion of value. "Thingishness" is good and that which is unthingish is somehow illusory and "unreal".

Samuel Johnson kicked a stone to show that in his epistemology he clearly distinguished the "real" from something else which surely was the unreal. But one wonders about the class of stones. Is that class "real" in the same sense as the single stone? And, again, what about the aggregate of protoplasm and ideas and actions and experiences which called itself "Samuel Johnson"? Was it real?

The reason I believe that Gregory Bateson is consequential, now and for some while to come, is that he deals in epistemological health.

Epistemology is not what we think, say, and feel, but how. The rules of articulation.

In the technological West we are epistemologically sick unto dying.

These excerpts from the glossary of Bateson's book-in-progress, The Evolutionary Idea, *can be medicine. What we do, right or wrong, depends on how we think. How we think has structure, and can be restructured, or at minimum, reclarified.*

The pump don't work 'cause the vandals took the handles.

— SB

And then there is the modern fad for suggesting that every human being must have his or her own idiosyncratic "reality". It is true that epistemologies and ways of perceiving differ from culture to culture and from person to person; and it follows that, through different ways of perceiving, the same outside world will appear different. But to suggest that this outside world will be different is to accept the premise that "reality" is completely un-thingish, that it indeed has none of that value in contrast with which the "unreal" was devalued.

All this boils down to a rather simple conclusion: that all uses of the term "reality" hinge upon some variety of the Cartesian dualism. "Matter" is to be considered "real", while "Mind" is therefore considered to be less real. But yet, as even Descartes knew, it is "mind" which does the considering.

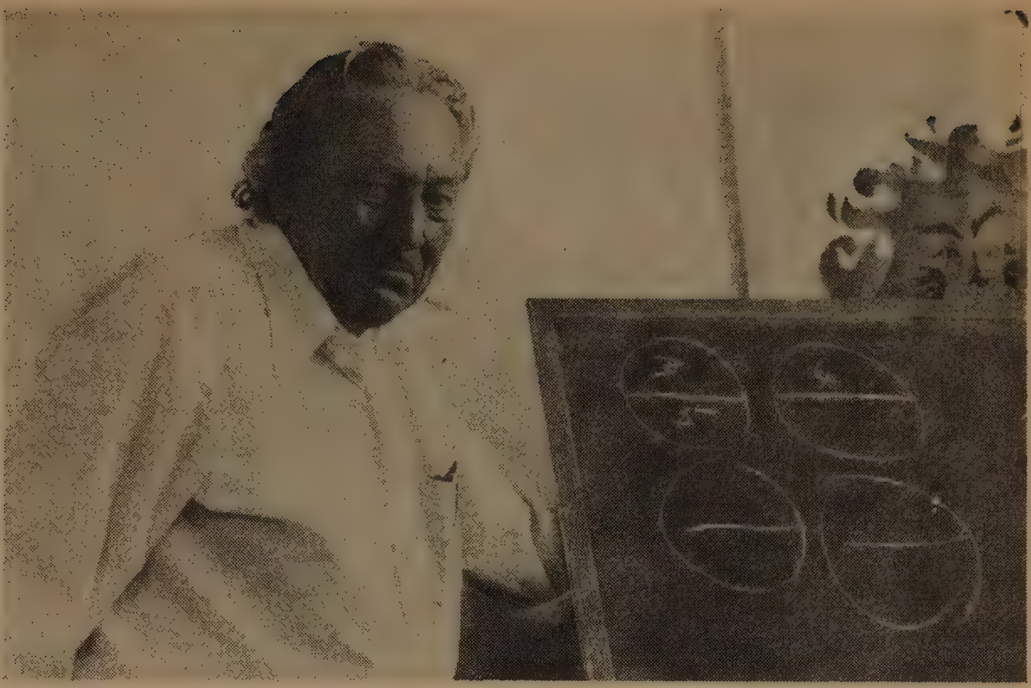
In my experience, there are three sorts of people who use the term "reality":

(a) those who would negate the value of all that is not thingish. Some being against the intellect, others against emotions or feelings.

(b) Those who would classify thought and feelings as manifestations of the transcendent (i.e., non-thingish) supernatural.

(c) Those for whom idiosyncracy (private reality) is the only order.

CODING and REDUNDANCY



Andrew Fluegelman

Gregory Bateson leading an Esalen Institute seminar in October 1974 on "Adaptation, Addiction & CoEvolution", of which he said, "We shall talk about the growth of biological relationships as if all such phenomena are out of the same box. The word not mentioned in our title is 'dependency'. 'Adaptation' is one side of a sort of dependency which is given value in evolutionary terms. 'Addiction' is a sort of dependency which is supposed to be a bad thing. 'CoEvolution' leads to mutual dependency." With the diagram Gregory is demonstrating that distinguishing between a difference of a difference of a difference boggles the mind.

Of the vast variety of sorts of redundancy, a few have received names, and these names are useful because many characteristics of any information-processing system are determined by the sorts of coding upon which that system depends. In particular, the limitations and pathologies of the given system depend upon the styles of coding.

If, from perception of some X, it is possible to make better than random guesses about some Y, there is "redundancy" between X and Y, or "X is a coded message about Y", or "Y is a transform of X", or "X is a transform of Y". Note that questions of intent or consciousness do not enter into these definitions. Whether Man Friday intended that Robinson Crusoe should find the footprint in the sand is an interesting question but not relevant to the identifying of the (in this case) iconic or part-for-whole code. In general, semantic argument is minimized by isolating the variables in the drafting of definitions.

Some of the possible sorts of redundancy between X's and Y's are listed below:

Causal and correlative. Hume may have been right in asserting that "causation" has no meaning other than that of "sequential correlation". Indeed, as analysts of information processing, we cannot care about any other meaning that "causation" may have. There is "redundancy" between cause and effect, and that is all we need to know within the domain of creatura (i.e., that realm of explanation where differences make a difference). We note only that when a given known "cause" is perceived, its known "effect" may be expected; and, *vice versa,* perceiving a known effect, we shall guess that its known cause preceded it.

The commonest errors or pathologies of systems which rely upon "causal and correlative" coding arise

(a) from seeing only those causes and effects which are most obvious and ignoring the many other conditions which may be necessary to make the given "cause" effective, and ignoring equally the many collateral effects which may spread through the world in addition to the particular effect which the system "seeks";

(b) from regarding the linkage between cause and effect as more direct than it commonly is; and

(c) from ignoring the circumstance that both "effect" and "cause" are usually (or always) components in circuits of causation.

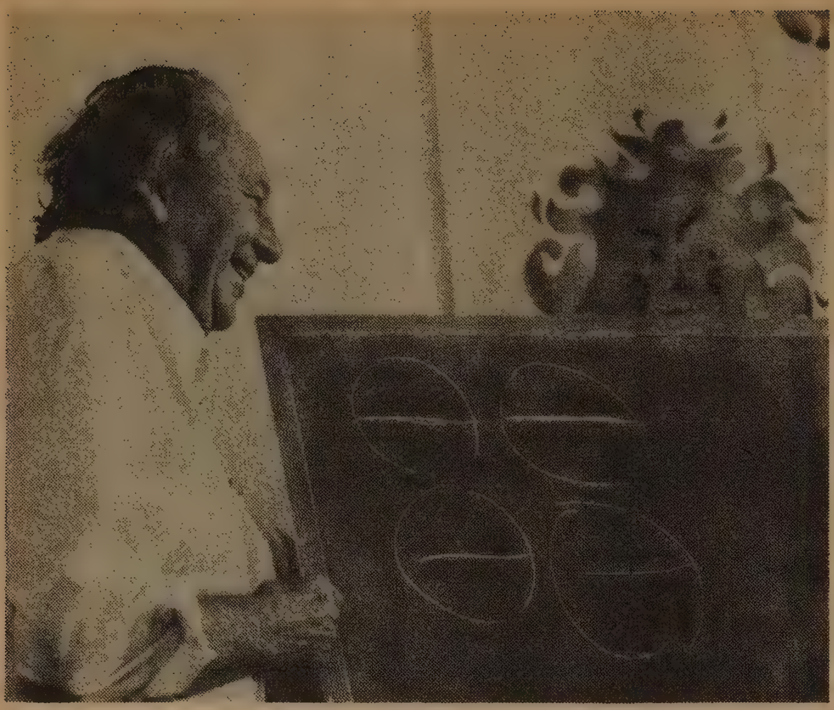
◆

Analogic. This type of redundancy or coding depends upon quantity and measurement (not upon numbers and counting). Some quantity in some X can be used to guess or predict some quantity in some Y. In principle, there is no lower limit to the size of the differences which could make a difference. In practise, the resulting infinitesimals become blurred.

Example: a typical analogic computer for mathematical multiplication might be constructed by combining measurements of volume with measurements of time. To multiply 15 x 4, set a faucet to run four gallons per hour, let it run for fifteen hours, and measure the liquid that has come through the faucet. To get the same result more rapidly, set the faucet to run four hours at fifteen gallons per hour. In principle, it does not matter which way the operation is performed. All that matters is the relationship between clock and faucet.

In general, analogic computers are clumsy and inflexible. They are only useful where a very large number of similar computations must be performed, e.g., in preparing tide tables and the like.

[more →]



The characteristic errors which accompany the use of analogic coding in computation are those of approximation. At every step, measurements of rate, of time, of volume, etc., will be approximate and, if the computation involves many steps, these approximations may compound each other to create gross error.

◆

Digital. This type depends upon counting and numbers (rather than measurement and quantity). The essential is that those differences which make a difference are sharply defined contrasts with no intermediate values. Such discontinuity is characteristic of: the difference in meaning and in sound between "yes" and "no"; the difference between "0" and "1"; the difference between any pair of integers; the difference between any pair of letters of the alphabet; the difference between phonemes in spoken language; the difference between genetic allels.

The "all-or-nothing" rule in neurophysiology asserts that a neuron either "fires" or does not fire. There are no halfway intermediates. This rule asserts a digital component in the brain and neural system. But there seems to be also a determination of neural firing based upon variable thresholds, controlled by hormonal environment and other quantitative factors. The brain thus seems to combine the analogic with the digital.

Similarly in genetics, it appears that the genes are discontinuously either present or absent and that this lies behind the phenomena of Mendelian dominance and recessivity: the phenotypic effect of presence of one dominant gene is not changed by presence of a second gene of the same kind. Two "yes" messages say no more than a single "yes" message. On the other hand, the digital mechanism in genetics seems to be combined with an analogic component which geneticists call "penetrance".

◆

Iconic. In this type of coding, information is organized into a usually pictorial or auditory image of the referent. In a few cases, the image is an almost direct transform of some material object — the footprint of Man Friday is a case in point. But more usually the image is a synthesis from a very large number of digital bits. The newspaper picture made by the "halftone block" process consists only of dots, each one of which is a digital bit. But together, viewed through the human eye, these can be combined into an image.

Of course, no camera ever "saw" an image. Similarly the optic "image" cast by the eye's lens upon the retina is only a very large number of stimulated or unstimulated end organs. But from the resulting shower of impulses traveling in the optic nerve to the brain a mental image is made which, when "I see you", I consult for details.

Apparently it is economical of neural machinery to have the information presented in this way in enormously complex but organized masses of bits. The girl who looks in her mirror, to see her image of that image which the mirror creates, will receive much more information than she needs. She thought only to learn whether her nose was shiny, but she must perforce create and see an image of her whole face. It is unclear what economy of neural or other function is achieved by this sometimes wasteful method of organising the myriad bits of information.

The common error of this method of coding follows from the excessive credibility of the image.

◆

Ostensive. This is perhaps the most primitive of all methods of presenting information to an organism: "Show him the thing itself". But it is also true that all the more complex and sophisticated codes — especially verbal language — can only be shared between persons if the meaning of many of the chunks of message material is communicated by ostensive methods. "Put it here on the table!" From such sentences (and only from such) can a child learn what is a "table" (and what is "here", and what is "it" and "put").

I cannot conceivably teach you a foreign language by talking to you in that language only over the telephone.

A common error arising from ostensive coding is to substitute for the name of the object shown that of some other component of the transaction. If, in a foreign language region, I point to the constellation "Orion" and ask his name, I shall perhaps get the native word for finger, or perhaps the word for "cloud" or "sky".

Ostensive coding imposes narrow limits on what can be said. The tale goes that Cratylus, a disciple of Heraclitus, learned from his master that all nouns are fundamentally misleading. He therefore gave up the use of language in favor of ostensive communication. He pointed with his finger at this and that. He was never able, however, to point to his reasons for not using words. He never acquired any disciples.

◆

Part-for-Whole. Grammarians use the word "synecdoche" for that figure of speech in which the name of a part is used as a term for the whole. The example which is repeatedly used is "ten head of cattle". This is a rather special and, in English, rare usage complicated by the singular form of the unit connoted.

In daily life and especially in nonverbal exchanges, we constantly use the part to mention the whole. When I clench my fist, I am mentioning blows of which the clenched fist would be a part. In general, that whole category of messages which ethologists call "intention movements" is composed of postures and muscular contractions which if completed would be actions of aggression, sex, retreat, eating, nest building, etc., etc. In all these cases it is important that, while the whole of some action sequence is mentioned by showing the intention movement, that movement is not the whole and may occur in contexts where the whole action would be utterly inappropriate. To use a part of combat behavior to threaten the possibility of combat is very different from engaging in immediate attack. The intention movement has often a meaning almost the exact contrary of that which the completed action would have. To threaten attack is by no means the same as to attack.

Threats commonly indicate that the individual who emits the threat is unwilling to engage in combat. Similarly the well-known surrender signals of dogs and other animals, while owing their meaning to the defeat or weakness of which they are parts, do not express a willingness to be destroyed, but, contrariwise, are an attempt to ward off destruction.

Part-for-Whole coding is also a principal means for understanding the material world around us. It is rarely possible to see the whole of any thing. We see one half of a ball and guess at the other half. We see the trunk and leaves of a tree and guess at the roots. We hear half a sentence and guess the rest. We abbreviate words to a few of their constituent letters. And so on.

The well-known experiments of Shannon, demonstrating that although many letters are dropped from written English the remainder will still be readable, are in fact demonstrations of part-for-whole coding.

◆

Evolutionary Coding. The information which is accumulated in organisms by evolutionary process is not usually of any of the sorts described above. It is rather complementary to those environmental phenomena to which the organism must adjust. The embryo shark does not have information about hydrodynamics but about how to grow to a shape which, though the creature does not — need not — know it, will fit with the surrounding hydrodynamics.

In cases of acclimation, the matter is somewhat more complicated. If I go up to, say, ten thousand feet, my first adjustment to that altitude will be panting and tachycardia. But if I remain for more than a few days a deeper adjustment will occur, involving changes in heart muscle, hemoglobin supply, and so on. It would seem that the information which sets going this secondary process of acclimation is probably provided by some component or collateral effect of the primary adjustment.

It is as if I used not a thermometer but the behavior of my house thermostat to tell me when to open or close the windows.

◆

Holograms. In most of the above methods of coding information, it is possible to point to particular parts of the input and to relate these parts to particular locations in the receiving system. This dot on the halftone block corresponds to that location in the object represented. But this spot-for-spot method of representation is not always present.

A seeing man on entering a room will use his eyes to obtain spot-for-spot images of what is in the room. The blind man, using wind currents and echoes, will get much of the "same" information but in a very different form. If a sofa has been moved to a new position under the window since the last time he visited the room, the difference between the room then and the room now will be perceptible to him, wherever he is in the room. A component of the change will be everywhere in the room and will be especially evident as the blind man moves around.

In principle, all resonating systems have this peculiarity that all parts of the system will be changed when any part is changed. So that to sense organs which can register the change, all parts of the system carry information about the change.

In other words, there is redundancy between all parts of such a system.

To read this redundancy will require, of course, some special skill and knowledge. Here more than anywhere else it will be evident that only differences can be sensed and that a scanning process will usually be necessary. A blindfolded man sitting still in a wood will not usually be able to locate the trees which surround him, even if he makes sound. But place him in a moving automobile and he will hear the echo of its engine as its sound bounces off every tree that he passes within ten feet. We live in the midst of a sound hologram, could we but perceive the information — the differences — which it contains.

In principle, all resonating systems have holographic characteristics. The simplest case is that of the interaction between sounds of different frequencies which generates beats. More complex examples arise in so-called *moiré* patterns. When two repetitive systems combine, a third is necessarily generated.

Evidence is accumulating that in the mammalian brain such resonating systems exist in neural networks and may play an important part in information retrieval (i.e., recall). Whether such models, involving resonance, are relevant in evolution, morphogenesis, and ecology is not known — but probable. ■

PERSONAL COMPUTERS

EDITED BY MARC LE BRUN

New section, new editor.

Listen, it is very likely true that little computers are on the way to revolutionizing human behavior. And beneficially. That's a faith — and an experience — I share with everyone writing in this section.

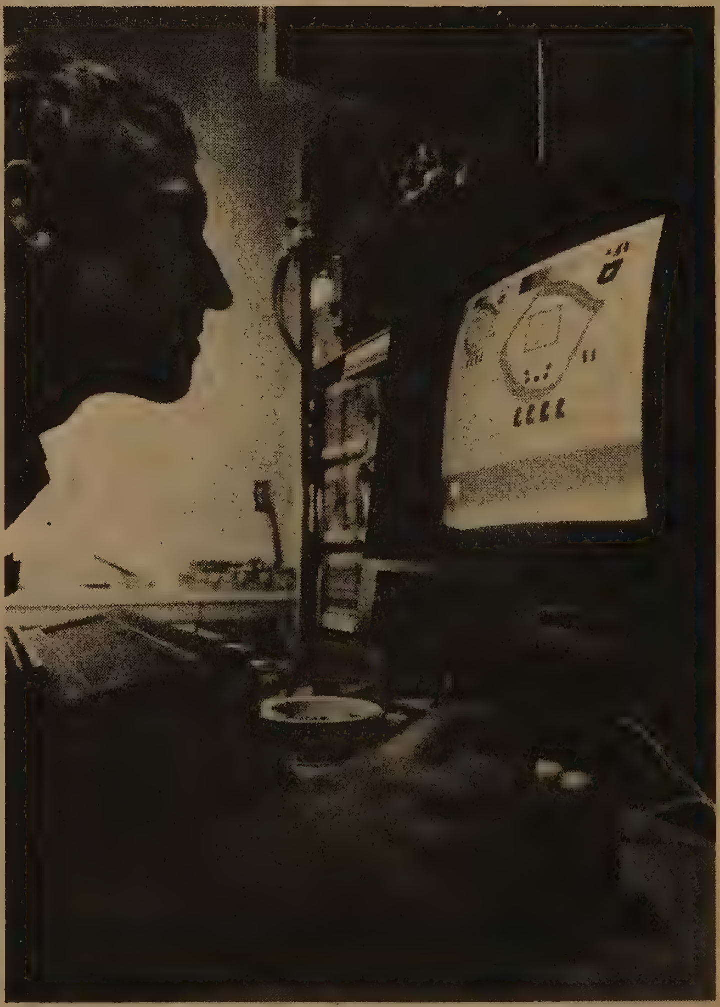
Personal computers are defining a generation the way dope did ten years ago. Take a look at the camera counter at your next department store: who's that messing around with the Hewlett-Packard scientific calculators on display? Rotten teenagers!

Eager not to be left out, we herewith become the first general magazine with a computer science department. Our bias is to the hackers and students, to hands-on messing around, to letting theory come from practice. By practice I mean obsession. These people stay up all night routinely.

Our section editor, Marc Le Brun, is typical of the breed. He's 22, a high-school dropout, an old hand with Portola Institute, Dymax, and People's Computer Center, familiar with the back doors of the Stanford Artificial Intelligence Laboratory, Xerox PARC, and the ARPA Net linking all the nation's major computer centers.

Welcome to wonderland.

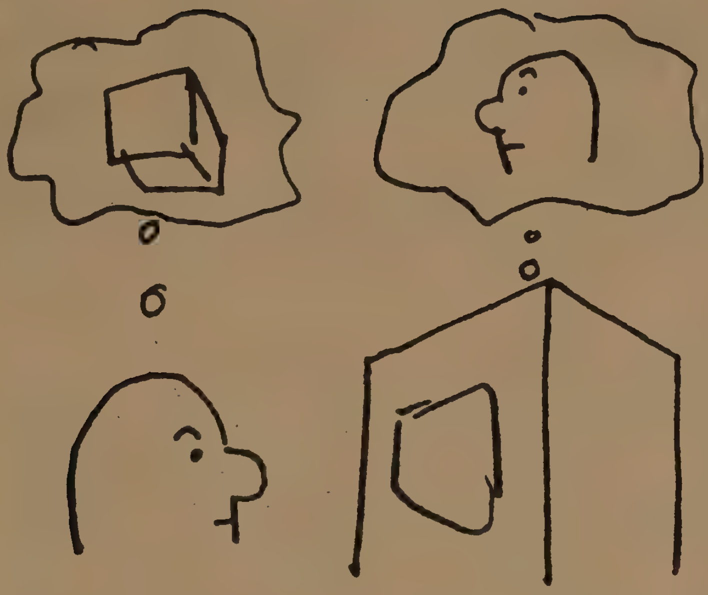
— SB



Annie Leibovitz

SB doodling with "computer paintbrush" at Xerox Research Center

PHILOSOPHY



From Computer Lib/Dream Machines

> *It is always difficult for a culture to adapt its philosophical framework to changing circumstances, and in particular for it to come to grips with the implications, physical, social or psychic, of new technologies. We have yet, for instance, to completely master the implications of technologies as old as the Wheel and Fire, even when they are represented in a form as mundane as the automobile. This philosophical hysteresis is greatest amongst the newest technologies. Integrated circuits, having enough intricacy and delicacy to gladden the heart of an Elf, coming packaged, for all their tremendous variety of function, in identical "black boxes", possess an extremely large mystification factor. Making a solid attempt to reach any kind of clarity in this area is both frustrating, and, like many metaphysical challenges, perfectly exhilarating. The following are some first steps in that direction.*
>
> *— Marc Le Brun*

THE HUMAN USE OF INHUMAN MACHINES

BY DAVE CAULKINS

Self-introduction:

Who Is Dave Caulkins?
A tool designer and builder (the paper they gave me at college says 'electrical engineer' on it), a toy designer and collector, an internal space junkie (3 kinds of psychotherapy and 4 different spiritual paths), occasional businessman (ex-president of biofeedback equipment company), and general all-round dilettante. The tools I have built during the last 15 years have almost all involved designing, programming or using computers.

I am not an expert on digital computers (or anything else); I've worked with them a lot and have strong opinions about them.

INTRODUCTION

The price of energy, commodities and human labor is going up and will probably continue to do so for some time. The price of storing, processing and communicating information by computer is going down and will probably continue so for 5 or 10 more years. The smallest computers, the microcomputers (weighing less than a pocket calculator and about 30 in.^{2} in area) have substantial capabilities and cost $30 or less. Computers are a major influence on your life; this influence will increase exponentially (probably doubling every 2 or 3 years) for some time. Computers are presently tools for only a tiny fraction of the world's people. The rest react to them with the anxiety generally provoked by a machine that seems to mimic human capacities.

I believe computers are more accessible and useful to all people of reasonable intelligence than is generally realized. Computers are the most interesting toys and/or tools around and have significant energy conservation applications. I think real opportunities exist for clever non-computer people to learn about and use computers for their own purposes; I believe such people could make major contributions to computer use for genuinely human purposes.

This piece is not intended to be an exhaustive tutorial on computers or information theory; it is meant to catch your interest so you'll dig deeper on your own.

COMPUTERS AND PROGRAMMING — THE 25¢ LECTURE

A computer acts very like a fast file clerk with whom you must communicate in writing. The clerk does exactly what he is told; no more, and no less. Here, as we shall see, is where ugly difficulties arise. The clerk is incredibly fast — he can work about a million times faster than a human. Suppose you want the computer/clerk to pay your gas bill; the instructions you write for him might read as follows:

1) Get the gas bill from the 'IN' basket on the desk.
2) Get the checkbook from the top left desk drawer.
3) Find the next blank check in the checkbook.
4) Copy the 'balance forward' number from the check stub to the scratch pad on the desk.
5) Copy the 'amount due' number from the gas bill to the scratch pad.
6) Copy the 'amount due' number from the gas bill to the space following '$' on the check.
7) Copy the 'amount due' number from the gas bill to the 'this check' space on the check stub.
8) Subtract the second number on the scratch pad from the first.

[more →]

9) Copy the answer from step 9) to the 'balance forward' space on the next check stub.
10) Convert the 'amount due' number to alphabetic form and write the result in the space preceding 'dollars' on the check.
11) Copy the date from the top sheet of the desk calendar to the 'date' space on the check.
12) Copy the name of the gas company from the gas bill to the space following 'pay to the order of' on the check.
13) Sign the check in the lower right hand corner space.
14) Get the gas company return envelope from the 'IN' basket on the desk.
15) Get a 10¢ stamp from the lower right desk drawer. Moisten the back of the stamp and stick it to the upper right front corner of the envelope.
16) Separate the check from the check stub and put the check in the envelope together with the gas bill.
17) Moisten the envelope flap; seal the envelope and put it in the 'OUT' basket.
18) Remove the top sheet from the scratch pad and put it in the wastebasket.
19) Put the checkbook in the top left desk drawer.
20) Ask the boss for more work.

This gas bill program is very similar to what a computer would require to do a similar task. The program gives a feeling for the incredible amount of detailed instruction required by a computer before it can do anything. Programs such as this are very prone to errors, known in the computer game as 'bugs.' The gas bill program has a lovely bug in statement 18). The computer, doing exactly as it is told, will put the scratch pad in the wastebasket. This produces the interesting result that the first month's gas bill will get paid perfectly but when the program is run a second time the computer will get the old scratch pad sheet in step 4). The old numbers would be used in step 8), screwing up the check book balance. The gas bill check will be wrong, but worse than this any other checks written will now be wrong. Other bug-free programs will now produce bad checks; the bug will be very hard to find. After programs grow beyond a certain size they can contain subtle bugs that may not appear for years. In a program preparing bills for Sears the resulting errors are relatively harmless; in a program operating the autopilot of a jet airliner the problem is more acute.

I think the big problem in computer use is that of human expectations. We anthropomorphize the machine, expecting it to behave like the human information processors we've dealt with before. I (and, I'm sure, many other programmers) have had the experience of shouting at the computer after hours of frustration "Why don't you do what I want instead of what I say!". The machine, of course, has no more common sense, cooperativeness or hostility than a crescent wrench.

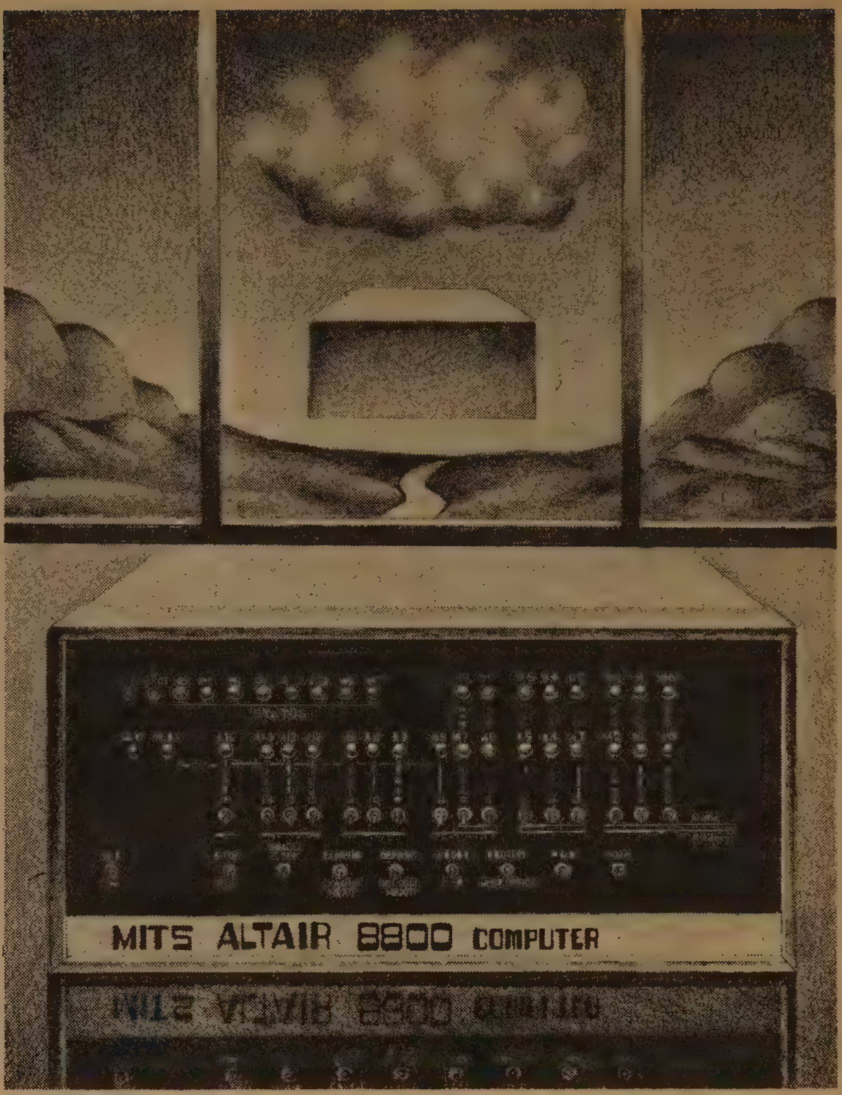
Attempts are constantly being made to ease this problem. Some of them are as follows:

Computer Languages

These are intended to allow more human-oriented modes of expression in writing programs. These human mode programs are then translated by the machine into its own language. The computer can catch some human errors; when it does so it prints out a nasty note to the human like "illegal operand" or "error 23." There are now several hundred languages, including such favorites as BASIC, FORTRAN, COBOL and ALGOL. The existence of so many indicates that it is not now possible to build a language usable for all (or even most) programs.

Structured Programming

This is a set of rules that limit and regularize the way programs are written. It is essentially a device to force humans to write programs that are easy to figure out by other humans. It seems to have produced a marked improvement in the number of program bugs that are found and fixed.



Altair 8800 computer kit

Artificial Intelligence

There have been a series of attempts to write programs that allow the computer to pursue a general problem-solving strategy rather than following a rigid sequence of instructions. Unfortunately (or fortunately, depending on your point of view) these attempts haven't been very successful. There are a few programs that can prove mathematical theorems or exhibit modest skill in playing games, but none to which you can say "do my income tax" or "figure out how to pay my monthly bills." More interesting questions like "what is your advice on the energy crisis" or "is there a God?" are well beyond the present state of the art.

We know how to build cheap, fast computer hardware, in the past 20 years computer operating speeds have increased by a factor of more than 1,000 and prices have dropped by almost as much. We don't know how to write cheap, accurate programs; the cost of programming has not decreased very much at all in the past 20 years. We know very little about making the computer assume most of the burden in bridging the human-to-machine communication gap.

I am convinced this is an area where a talented amateur without preconceptions about what is impossible can do much better than those of us who have been floundering around in this mess for years.

INFORMATION

Computers are primarily information manipulating machines, and information is weird stuff. This page, a TV program, a stop light, a computer program, a wink, a car's accelerator pedal, a magnetic tape, etc., etc. are all devices for conveying or transforming information. In the computer game we measure information quantity in a unit called a bit (a contraction of 'binary digit'). The telephone bell conveys one bit of information — ringing (bit = 1) or not ringing (bit = 0). The information content of some ordinary things is as follows:

The character "W"	7 bits
The word "Win"	7 x 3 = 21 bits
An average size book	7,000,000 (7×10^6) bits
A half-hour color TV program	1×10^{10} bits
The Library of Congress	1×10^{15} bits

A lot of the early work on the mathematical theory of information was done by Claude Shannon (1). His stuff is not light reading, but if you really want to understand information theory and can handle a good deal of mathematics I recommend it. At the other end of the difficulty spectrum a wise man boiled it down to one sentence — "Information is surprises." If I say to you "your hair is on fire" I have given you 112 bits of information; if in 15 seconds (while you are running for some water) I say again "your hair is on fire," I have added no bits to the original 112.

Another kind of information is control information; its only difference from the kind we've been talking about is that it is directly connected with an on-going process in the real world. Consider a hot-air furnace. It can be considered as a computer of a primitive kind handling two bits of information:

- Thermostat temperature (input bit)
  1 - temperature OK
  0 - temperature too cold
- Gas control (output bit)
  1 - gas on
  0 - gas off

The furnace computer operates on a simple program:

1) If input bit = 0 (too cold) set output bit to 1 (gas on)
2) If input bit = 1 (OK) set output bit to 0 (gas off)

Of vital importance is how often the program is executed — its information or data rate. If it's once a day you will freeze or roast; if it's once a second the furnace will turn the gas off and on too much. Once every 10 minutes is probably about right; this is a data rate of 2 bits/10 minutes or 12 bits/hours. In computer terms this is very slow; modern computers handle data at rates ranging from 4×10^5 bits per second (BPS) for the $30 microcomputer to 2×10^8 BPS for a $10 million scientific computer. It is therefore quite possible to program computers to pilot jet airplanes, control all kinds of industrial processes, etc. It is equally possible for a computer to control the detailed operations of an internal combustion engine (valve opening and closing times, carburetor or fuel injector operation, spark plug firing, etc.) for each rotation of the engine drive shaft.

It is interesting to consider human capacities for information handling:

Inputs eye — 200 to 300 BPS for reading; several million BPS for observation of moving objects.
ear — 80 to 160 BPS for speech; tens to hundreds of tonal pitches distinguishable.
touch — several BPS.

Outputs humans are used to speech for output with associated hand movements for printing, writing, typing, pushing buttons as well as adjustment and control movements (steering wheel, radio volume and tuning, etc.)

speaking — 80 to 160 BPS
handwriting — 12 to 16 BPS
handprinting — 8 to 20 BPS
control movements — 7 to 16 BPS

typing
skilled — 60 to 100 BPS
unskilled — 8 to 16 BPS

Humans are used to motion, color, shape detection, gestalt perception and pattern recognition. Humans can handle only about seven 'chunks' of information simultaneously. The object of much learned perception is to create 'chunks' which organize large amounts of data into compact representation. (2)

Information is a major component of political power. Johnson, Nixon and others used this power negatively by trying to conceal the information on which they based their decisions. Watergate has demonstrated that the positive use of information power is a very strong force. A bad or self-serving decision is very hard to whitewash if the media and the people have access to the significant information that went into the decision making process. Secrecy is becoming less and less viable as a technique for high level decision makers.

It looks like computers can materially strengthen access to government information. The forces of efficiency and economy are causing more and more government information to be put into computer data bases; the Freedom of Information Act should allow public access to almost all data base information. In the old paper document days citizens could be prevented from finding things out simply because they didn't know where or how to search voluminous, geographically distributed records. Computer based techniques allow powerful search strategies to be rapidly applied to very large masses of data. These techniques can and should be available to all citizens including Ralph Nader and Senator Proxmire.

Economists have a hard time dealing with information. Barrels of oil, hours of labor, acres of land, bushels of wheat — all these things fit fairly neatly into economic theories. Bits of information are more elusive. They plainly consume resources and energy to create, transmit and store; but the relationship between this consumption and the value of the resultant information is obscure. Those green pieces of paper with presidents' pictures on them in your wallet or purse are almost purely informational in nature; this may help to explain why economists haven't done too well in dealing with them either. One thing seems clear — with the cost of information manipulation dropping and the cost of everything else going up, the use of information processing techniques to substitute for or improve on energy or commodity consuming activities is going to increase.

The legal character of information is also not clear. In the Ellsberg case it was obvious to all that the information content of the Pentagon Papers was the important issue; but the prosecution had to resort to the charge of theft of physical objects — that Ellsberg had stolen certain pieces of paper from the government.

All these things seem to me to indicate that many of our institutions are inappropriate to or incapable of coping with the 'age of information' into which we are rushing. The institutions can and should be changed, but I suspect this cannot be done adequately without a full appreciation of information theory and computer science.

COMPUTERS AND ENERGETICS

Because computers are cheap and fast, they can be used to control many energy-consuming processes to raise efficiency and thus lower energy consumption. The internal combustion engine is a prime candidate for this kind of control. A microcomputer could examine engine state 1,000 times per second, dynamically optimizing engine performance by adjusting fuel/air ratio, spark plug timing, etc. on each crankshaft rotation (or even on a cylinder-by-cylinder basis) to achieve maximum fuel economy. This would be like

[more →]

giving your car a tune-up several times a second. I suspect that fuel economy improvements of better than 10% could be achieved.

Similar high efficiency computer control is applicable to many other areas of energy transformation and consumption. The efficiency gains do not come free; but the interesting thing is that the majority of the expense lies in building the required programs. Program writing is almost all human intellectual effort; little energy or other resources are consumed. The labor costs can be spread across very many applications and thus are not very great. The control computers on which the programs run will consume trivially small quantities of energy.

Since microcomputers cost $30 today and will rapidly decline in price to the $10 level there is no reason why they cannot be used on all internal combustion engines down to and including those in private cars. Microcomputer control for windmills, solar generators, etc. seems equally attractive.

On the big end of the computer size spectrum it is now beginning to look feasible to build computer models of large scale complex systems like world weather, national economies, ecological systems, etc. It seems prudent to experiment with problem solutions on a computer model before making irreversible commitments in the real world.

LEARNING ABOUT COMPUTERS

I believe that acquiring enough information about computers to be able to make some use of them requires a modest amount of effort comparable to that required to become an intermediate level chess player. I am obviously biased — I have been working with computers a long time, and what seems easy to me might not seem so to someone starting from zero. On the other hand about two years ago I hired two young, clever counterculture people to work under me at a large computer research project; neither had any previous computer experience. Within two or three weeks both were making useful contributions. A year later I left the project and any sponsoring influence I might have had stopped. They both continued to receive raises and other indications of management satisfaction.

How can you learn? Books are useful but not sufficient. I strongly recommend getting access to a computer and working with it. Some ideas for doing this:

- Go to your local school. Almost all colleges (and even some high schools) have computers. Many of these operate time-sharing services, permitting many people simultaneous access to the machine. Modern computers are quite reliable — about the only thing that hurts them is being turned on and off. This means they run 24 hours a day, and that they are often idle from 6 PM to 8 AM.
- People's computer centers. I know of one: PCC, 1919 Menalto Ave., Menlo Park, CA 94025. (415) 366-4444.
- Buy one. This is not as strange as it sounds. For about the price of a good Hi Fi you can get a kit for building a computer; the kit is no more difficult to build than a Heathkit stereo amplifier. The machine is called the Altair 8800. For more information write to: MITS Inc., 6328 Linn, N.E., Albuquerque, NM 87108. A two-part article on the 8800 appeared in the January and February, '75 issues of Popular Electronics.

■

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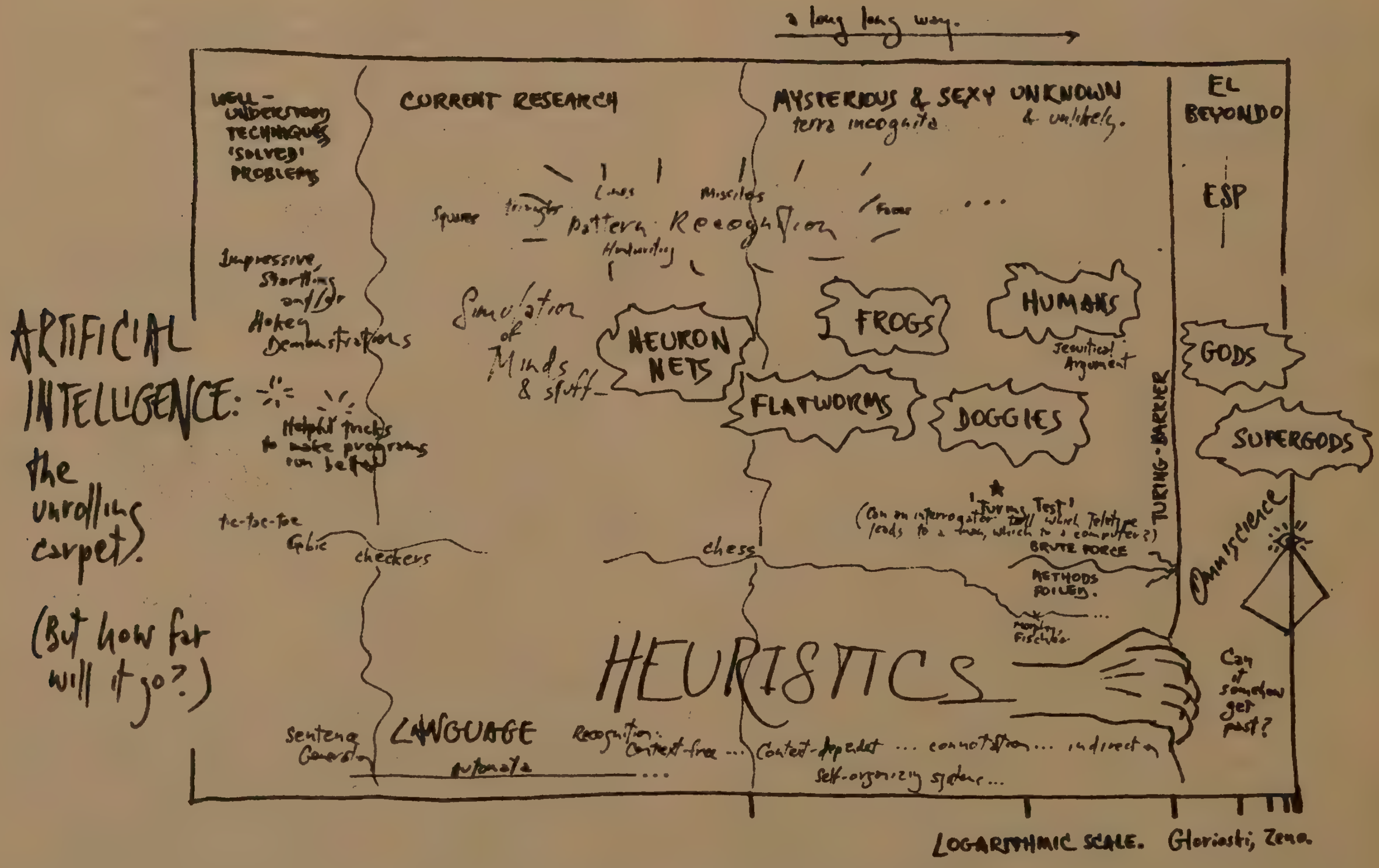
C.E. Shannon, "Communication In The Presence of Noise," Proceedings of The I.R.E., V37,10 (1949)

(2) This material based on a private communication from Robert H. Anderson of The Rand Corporation.


a long long way.
ARTIFICIAL INTELLIGENCE: the unrolling carpet.
(But how far will it go?)
WELL-UNDERSTOOD TECHNIQUES 'SOLVED' PROBLEMS
Impressive, Startling and/or Hokey Demonstrations
Helpful tricks to make programs run better
tic-tac-toe
Gblic
checkers
CURRENT RESEARCH
Squares
triangles
Lines
Missiles
pattern Recognition
Handwriting
Faces
Simulation of Minds & stuff
NEURON NETS
chess
HEURISTICS
Sentence Generation
LANGUAGE
automata
Recognition: Context-free ...
Context-dependent ... connotation ... indirection
Self-organizing systems ...
MYSTERIOUS & SEXY UNKNOWN & unlikely.
terra incognita
FROGS
HUMANS
Jesuitical Argument
FLATWORMS
DOGGIES
'Turing Test' (Can an interrogator tell which Teletype leads to a man, which to a computer?)
BRUTE FORCE
METHODS FOILED.
Bobby Fischer
TURING-BARRIER
EL BEYONDO
ESP
GODS
SUPERGODS
Omniscience
Can it somehow get past?
LOGARITHMIC SCALE.
Gloriosti, Zena.

From Computer Lib/Dream Machines, *see page 142.*

A response to "Plains of Science, Summits of Passion"

The 10 billion neurons of the individual human nervous system, and still more, the 3×10^{19} neurons of the whole human race (about 77×10^{19} if we include all human beings that ever lived) make a very large habitat in space-time — one that has developed an enormous complexity of mental species but has yet realized only a small portion of its total potential. One thinks of this as a vast ecosystem populated by images and ideas, perceptions and beliefs, and one perceives science as a small, but very productive subecosystem within this vast habitat. This scientific ecosystem is rather like the agriculture in the Middle West and the Great Plains, surrounded by a vast expanse of the meadows of ordinary experience, the lush forests of religion and art, and the wild glaciers and peaks of ecstasy and agony, mysticism and power, sainthood and devilry.

– *K. E. Boulding,*
Spring 75 CoEvolution Quarterly

Our collective nervous system has been extended in many ways. Concepts can be transmitted in speech, preserved on paper, and routed through the complex network of the phone system. These extensions of our mental habitat allow it to support a richer ecology, and they affect the kinds of concepts that are viable.

However, most concepts outside of nervous systems are inert; they need a complex, flexible host in which to live. Until recently only human nervous systems would do; now a wider and wider variety of concepts can live in computers. Furthermore, we've just about reached the point where it's feasible for individuals to own their own machine. Thus, computers have gone beyond being tools, however powerful, and have become an important part of the human mental habitat.

This is bound to change our conceptual ecosystem in drastic ways. So far, it's been an 'unconscious' development — people have been planning in terms of local actions and results, and no one (that we know of) has a very good model of the overall consequences. Something very similar happened in mechanical technology about the time the automobile was invented. We'd like to imagine that if people had thought then about the impact of developments like the automobile on the ecology, things might have turned out differently.

The prospects are potentially as exciting as they are threatening. New conceptual species will develop, defining new niches in the ecology, new competitive and cooperative games, and eventually new stable communities. The point is not to halt the change, but to realize that we're participants and to take responsibility for the larger effects of our choices. As a first step, we would like to start a public conversation on the impact of information technology on the ecology of mind. Our plan is to collect responses to this letter, edit them, and send the combined responses to all the original respondents. Perhaps parts of the conversation can be published in the CQ.

If you'd like to be part of this experiment, send your comments and suggestions, with your address, to:

540 Seale Avenue
Palo Alto, CA 94301

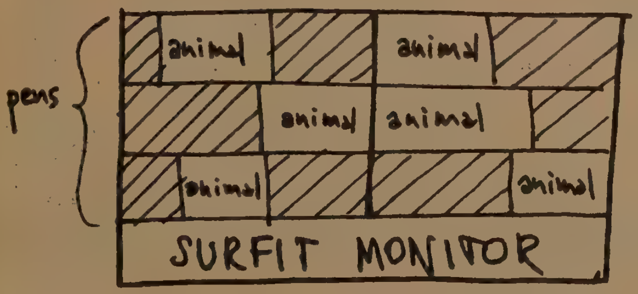
Depending on the response, we'll try to complete the first cycle of the conversation in one or two months. Also, please pass this article on to others who might be interested. We'd like the idea to get around.

— Jed Harris &
David Levy

SURVIVAL OF THE FITTEST

One of the stranger projects of the sixties was a game played by the most illustrious programmers at a well-known place of research; the place cannot be named here, nor the true name of the project, because funds were obtained through sober channels, and those who approved were unaware of the true nature of the project, a game we shall call SURFIT ("SURvival of the FITtest".) Every day after lunch the guys would solemnly deliver their programs and see who won. It was a sort of analogy to biological evolution. The programs would attack each other, and the survivors would multiply until only one was left.

It worked like this. Core memory was divided up into "pens," one for each programmer, plus an area for the monitor.



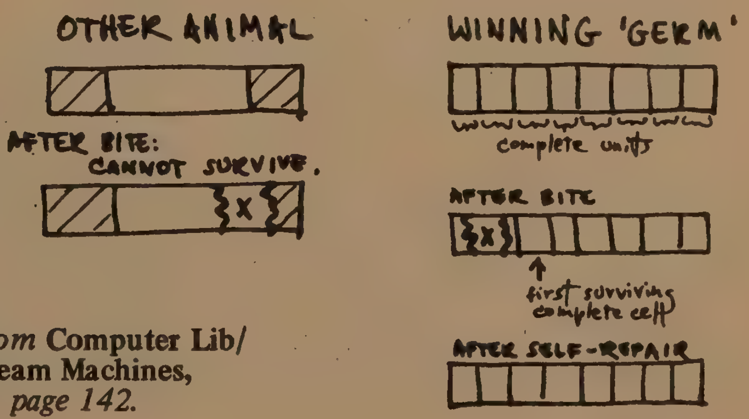
Each program, or "animal," could be loaded anywhere in its pen. The other programs knew the size of the pen but not where the animal was in it. Under supervision of the special monitor, the animals could by turns bite into the other pens, meaning that the contents of core at several consecutive locations in the other pen was brough back, and changed to zero in its original pen.

Your animal could then "digest" — that is, analyze — the contents bitten. Then the other animal got his turn. If he was still alive — that is, if the program could still function — it could stay in play; otherwise the animal who had bitten it to death could multiply itself into the other pen.

The winner was the guy whose animal occupied all pens at the end of the run. If he won several times in a row he had to reveal how his program worked.

As the game went on, more and more sophistication was poured into the analytic routines, whereby the animal analyzed the program that was its victim; so the programmer could attack better next time. The programs got bigger and bigger.

Finally the game came to a close. A creature emerged who could not be beaten. The programmer had reinvented the germ. His winning creature was all teeth, with no diagnostic routines; and the first thing it did was multiply itself through the entirety of its own pen, assuring that no matter where it might just have been bitten, it would survive.



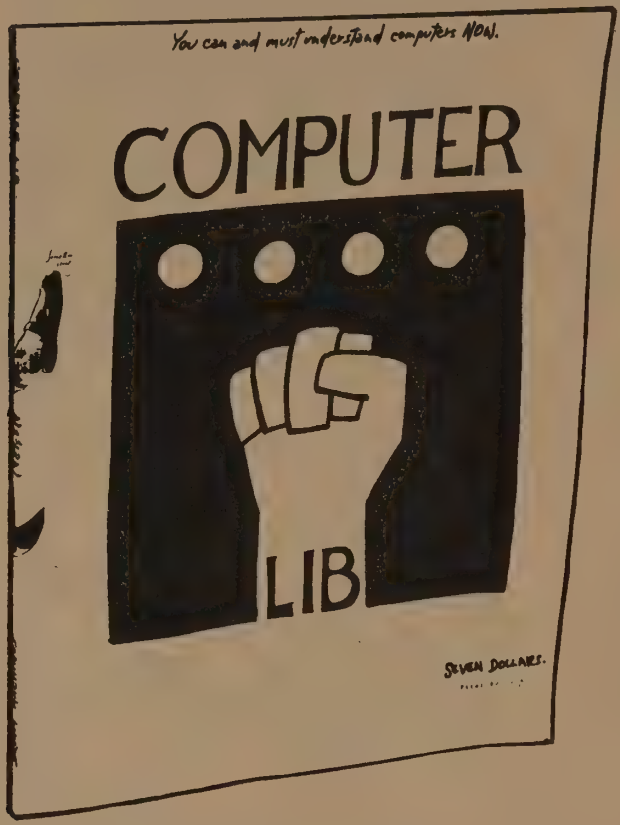
From Computer Lib/
Dream Machines,
see page 142.

Computer Lib / Dream Machines

The subtitle of this 128 page paper-bound under-ground publication is "You can and must understand computers NOW." It is a spirited, complex and very personal statement, an information packed message from someone who cares about people, machines, life and dreams. The two halves of the book are printed in opposite orientations so that Dream Machines *is literally the "flip-side" of* Computer Lib, *with a duality of content that is suggestive of those qualities associated with the two halves of the brain. Something for everybody, both of you.*

— Marc Le Brun

Computer Lib
Theodor H. Nelson
1974; 127pp.
$7.00 postpaid
from:
Hugo's Book Service
Box 2622
Chicago, IL 60690
or Whole Earth



With this book I am no longer calling myself a computer professional. I'm a computer fan, and I'm out to make you one. (All computer professionals were fans once, but people get crabbier as they get older, and more professional.) A generation of computer fans and hobbyists is well on its way, but for the most part these are people who have had some sort of an In. This is meant to be an In for those who didn't get one earlier.

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The principal magazines are (first few listed roughly by degree of general interest):

Datamation. $15 a year or free. The main computer magazine, a breezy, clever monthly. Lots of ads, interesting articles the layman can read with not much effort. Twits IBM.

Subscriptions are $15 if you're not a computer person, free if you are. Datamation, 35 Mason St., Greenwich, CT 06830.

Computer Decisions. Some $7 a year or free. Some nice light articles, as well as helpful review articles on different subjects. Avoids technicalities. Computer Decisions, 50 Essex St., Roselle Park, NJ 07662.

Computers and Automation. Avoids technicalities but quite a bit of social-interest stuff. Nobody gets it free; something like $7.50 a year. Berkeley Enterprises, Inc., 815 Washington St., Newtonville, MA 02160.

Computerworld (actually a weekly tabloid paper). Not free: $9 a year. More up-to-the-minute than most people have time to be. Computerworld, Circ. Dept., 797 Washington St., Newton, MA 02160.

•

Hey now, here's a magazine called Computopia. Only $15 a year. Unfortunately in Japanese. Computer Age Co. Ltd., Kasumigaseki Bldg., Box 122, Chiyoda-Ku, Tokyo, Japan.

•

"Assembly language programming is good for the soul."

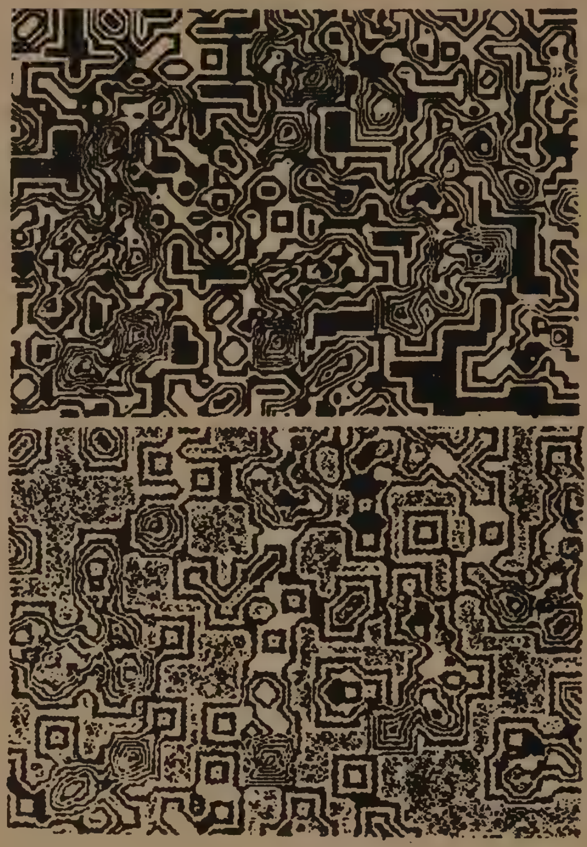
— Folk saying

How do computers make movies?

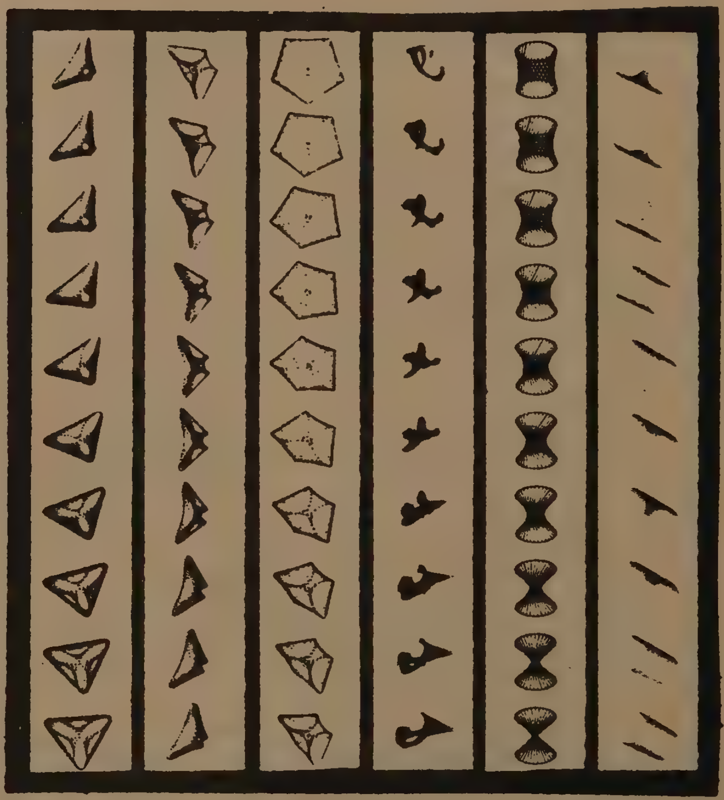
Well, first of all, computers do not make movies unless thoroughly provoked.

In fact, only people make movies. But computers, if sufficiently provoked, will do a lot of it: enact the movie and photograph it, frame by frame.

There is no single method.



Schwartz & Knowlton. Using the EXPLOR language, they make pictures and patterns scintillate and grow together.



John Whitney

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That reminds me. Nowhere in the book have I defined the phrase "computer lib." By Computer Lib I mean simply: making people freer through computers. That's all.

Two Cybernetic Frontiers

Stewart Brand, the mover of the Whole Earth (Catalog, Epilog, and now its CoEvolution) succeeded in making two apparently different ends meet. In **II Cybernetic Frontiers** *he puts between the same covers the Taoistic reflections of a sage and the fanatic life of bums. The sage is Gregory Bateson (***Steps to an Ecology of Mind***) who would despise being put into a disciplinary bag; the bums are computer bums whose bag is clearly moonlighting on the large computer networks that grow steadily over the United States and begin to extend their tentacles over the entire globe. Brand visited both, the sage and the bums, sipping tea with the former, munching doughnuts with the latter, talking softly, but mostly listening and watching in his unobtrusive, obtrusive way, being "stranger and friend" to his informants at the cybernetic frontiers. The harvest of Brand's explorations are the two major articles in this book which is (on the first page) dedicated to the Difference and (on the last page) to the Bond — because the difference is the Bond.*

After a Prologue, **II Cybernetic Frontiers** *opens with his conversations with Gregory Bateson: "Both Sides of the Necessary Paradox", followed by an Epilog I which is, in fact, a "synolog" connecting the first piece to the second piece, "Fanatic Life and Symbolic Death Among the Computer Bums", and closes with an Epilog (II).*

Indeed, in these two pieces the difference is complete, hence their inseparable bond. Bateson in his late-sixties, with deep roots woven into the complexity of a rich cultural context; the Bums in their mid-twenties sending out their rootlets in all directions, creating a cultural context for each other; the Bateson-dialogue appeared in **Harper's**, *the Bums-story in* **The Rolling Stone**: *these are the counterpoints of this composition.*

The Bateson-Brand dialogue on the Necessary Paradox inverts itself to expose the paradox of necessity. Necessities are tautological by necessity, hence they say nothing. To say something it is necessary to transcend necessity: this is the logical root of the necessary paradox.

How can this be told to the readers of **Harper's** *". . . such that our reader shall be thereby squeezed up a level of abstraction . . ."? Bateson doubts that it can be done. The difficulty, he knows "It's linear thinking: you've got to find an identifiable cause for an identifiable effect. And the argument cannot spread backward the way cholera spreads forwards. When you get them spreading both ways, then you can begin thinking about circuits — indeed circuits become inevitable." And he knows also Wittgenstein's diagnosis "The belief in causality is the superstition." which he paraphrases: "This is, I think, the insanity of . . . . Twentieth Century Occident." But Brand, one generation younger, knows differently. He knows his Bums and their knowledge of the absurdity of necessity, and gently coaxes Bateson into talking of transcendence: Lao-Tse's Tao (you ask a Taoist — "What do we do?" and he would say: "Follow the Way", and that's all he would say); Zenon's Paradox (each half of the paradox proposes the other); Caen's sensible non-sense (a man without God is like a fish without a bicycle); Bateson's Double Bind (the loving Jewish mother gives her son two ties; he puts one on to please her. She: "I see you didn't like the other one."); McCulloch's Heterarchy of Values (there is no summum bonum: when chosen in pairs, A may be preferred over B; B over C, and C over A); and, of course, Wiener's Cybernetics (in order to act one must see; in order to see one must act).*

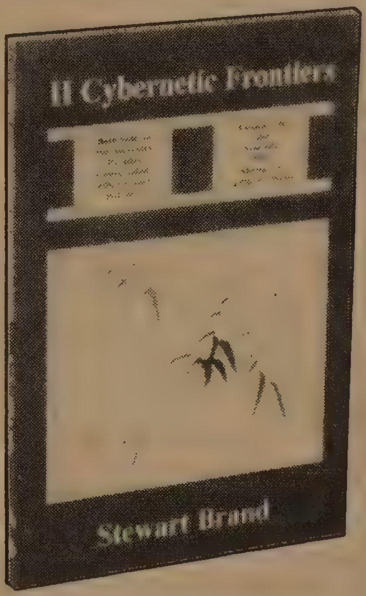
To know more about cybernetics from a man who helped in giving birth to this baby a quarter century ago was one of Brand's motivations to see Bateson in the first place. He recalled Bateson's statement in **Steps to an Ecology of Mind**: *"I think that cybernetics is the biggest bite out of the fruit of the Tree of Knowledge that mankind has taken in the last 2000 years. But most of such bites out of the apple have proved to be rather indigestible — usually for cybernetic reasons."*

And Bateson explains: "The whole thinking that goes with the words 'input' and 'output' is monstrously bad. It draws a line across the systemic structure. Here there's input and there's output, and it's me against the universe at once, the moment you draw that line. This actually throws away the whole cybernetic background for cybernetics, you know. The engineers have decided it is engineering. All they have to do, you see, is to cut off the circuit so that you have an 'input' on one end and an 'output' on the other, and those two never join up out in the environment. The input-output literature is very large, it's highly skilled engineering and all the rest of it, but it ignores the philosophy of the feedback.

But these were the ill begotten fruits of first-generation cybernetics: the cybernetics of observed systems. With a Bateson, a Brand, the Computer Bums, we have moved into the next generation: the cybernetics of observing systems. This is to be outside of a system to be inside; and inside to be outside. This is to be a Mobius Strip on a Klein Bottle; this is to transcend. This may be meditation, or laughter or play.

— Heinz Von Foerster

II Cybernetic Frontiers
Stewart Brand
1974; 95pp.
$2.00 postpaid
from:
Random House, Inc.
457 Hahn Road
Westminster, MD 21157
or Whole Earth



Ralph Gorin, nearest the display tube, warms up Spacewar contestants. Rocket controls are visible on knee of player at left — four buttons: one for thrust, one for torpedoes, one each for turn to the left and to the right.

HARDWARE

The time has more or less arrived when you can do it yourself. As in any technology, there's a lot of spade work between dabbling with the materials and a satisfying mastery of the media. There are very real aesthetic issues here, as well as engineering elegance. Here are some of the hard facts about hardware.

— Marc Le Brun

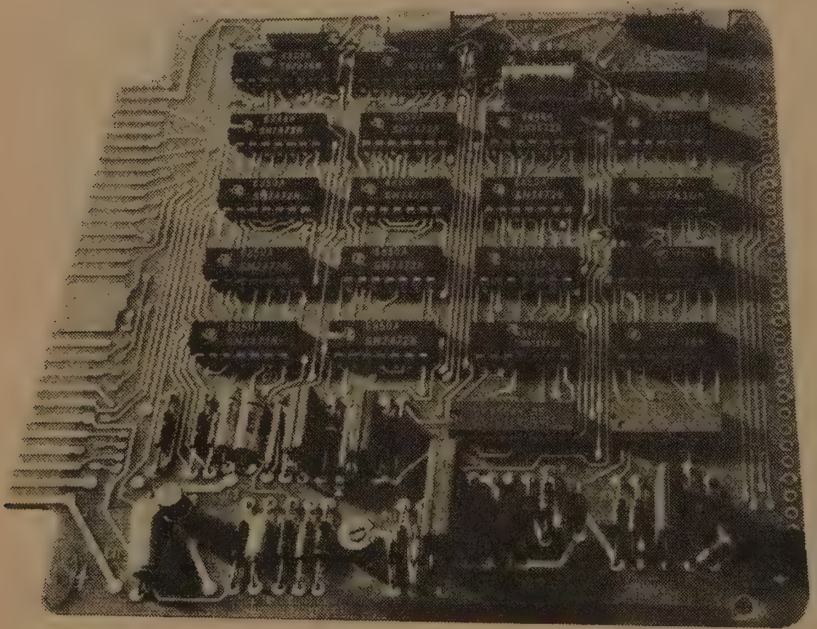
THE NATURE OF THE BEAST

BY MARC LE BRUN

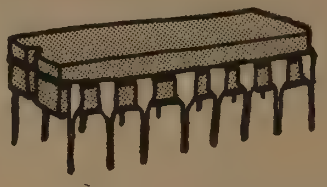
"Today's demonstration will involve the anatomy of the common electronic calculator, if I may have the class's attention please . . .", the Professor, grey-haired, in knit tie and white lab coat, pauses for effect before turning and removing the cover of the plastic terrarium. Inside, small dark shapes scuttle between sheet metal scraps, away from his groping fingers, arm bent at the elbow. Catches, then removes a small calculator no bigger than his hand, tiny red display lights winking fearfully. Holds it gently but firmly against the black formica top of the lab bench, stroking its keys in a comforting sort of way.

"All of us," continues the Professor, "are more or less familiar with these mundane creatures, but few of us actually appreciate their marvelous intricacy, their subtle beauty . . ." He gazes bemuzedly at his tiny prisoner, still trying weakly. "The purpose of this demonstration, then, is to gain an acquaintance with their inner nature . . ." A scalpel flashes, the lights display random numbers, dim, go out. He removes two small batteries and places them aside, carefully. Draws a breath, straightens to look in the eyes of the students before him. No one moves.

The Professor returns to his experimental subject. Wielding a nutcracker he breaks off the hard plastic case, as one would remove the shell of a crab. A few more deft movements and the various parts, keys, display, on/off switch, are separated and arrayed attractively about the bench. The Professor is left with a flat sheet about the same size and shape as the calculator, and studded with assorted electronics. He holds it up for the class to see. It looks like this:

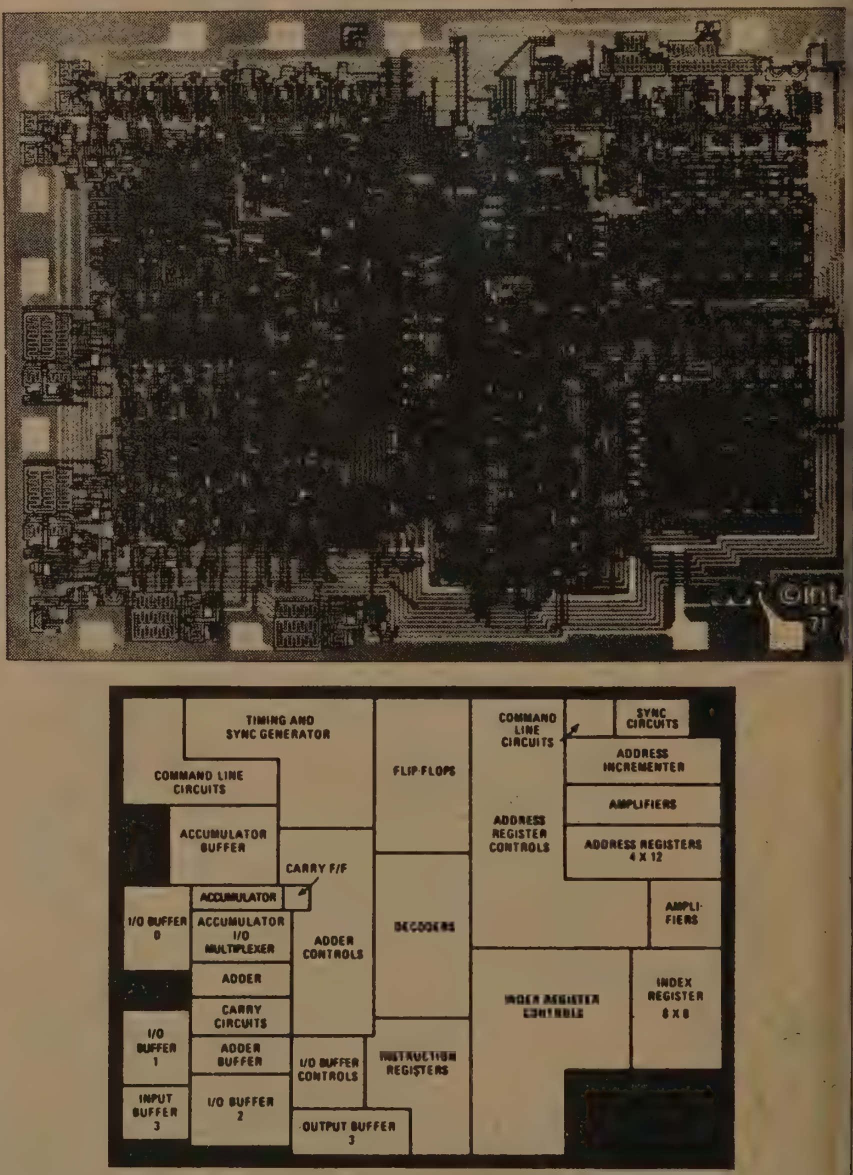


"Here you see the main body of the calculator, a printed circuit board, or as they are commonly called, a PC card." Silver glints in thin spidery lines as he waves the card under the fluorescent lights. "The PC board itself is a marvelous habitat with a complex ecology that includes both analog, or linear components" he wiggles a ballpoint pen at a group of small, gaily colored objects "and digital devices". Here he indicates the neat rows, generally black, with many metal legs. Brandishing a soldering iron he frees one of them and holds it aloft. It looks like this:



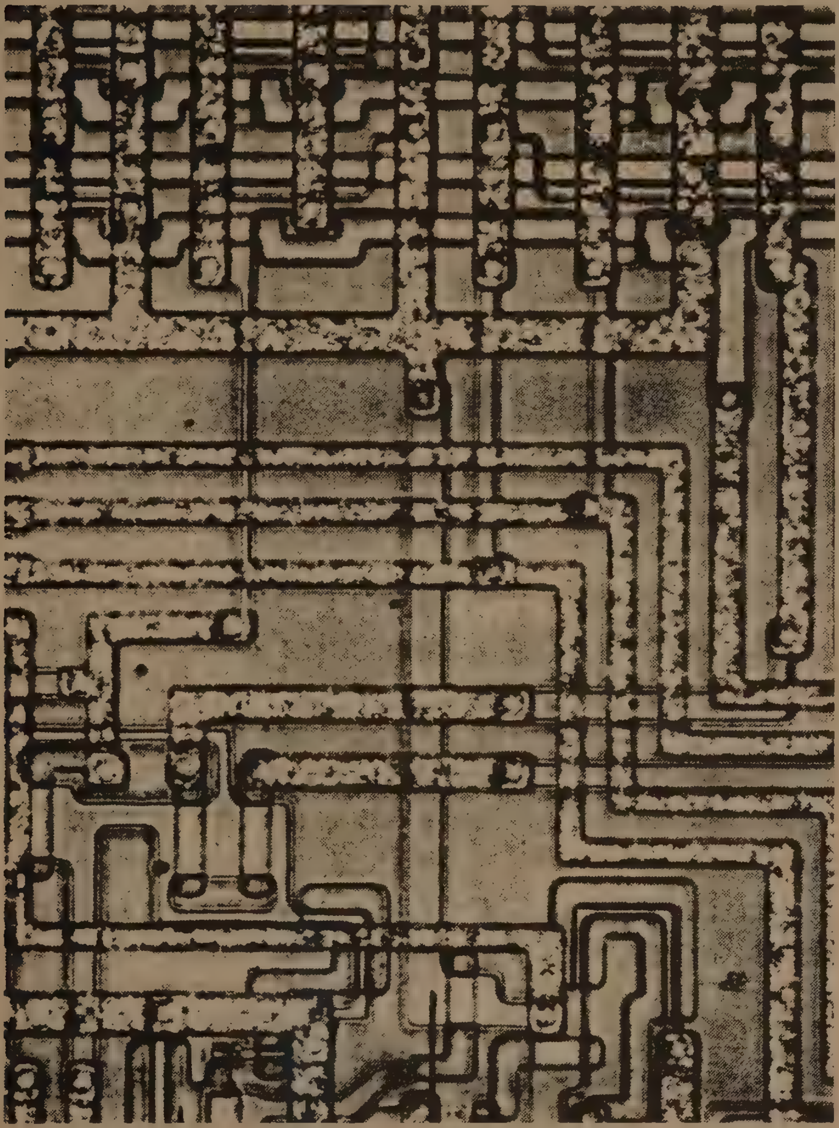
He sets it down and it begins to move aimlessly around, bug-like. "These are called DIPs, for Dual-In line-Packages. They are sometimes erroneously called 'chips'." While he talks he continues to unsolder the DIPs from the board, the bench is crawling with them. "The actual 'chip', that is the Integrated Circuit or IC", he continues pedantically, "is really much smaller, and the DIP is but one of the ways it can be packaged." He reaches out and snares one of the wandering DIPs. It nearly escapes by climbing over the top of his clenched fingers, but he puts his thumb on top, trapping it. "If I may demonstrate . . ." The scalpel flashes again. He takes a pair of tweezers to hold up a piece of something that glitters. It looks like this:

"Here's a better view." He places it under a projecting microscope. Now it looks like this:



Heart of the four-chip set, this central processing unit is a small but complete general-purpose computer that can execute 45 instructions. The four-bit adder, its central component, is at left center, as key diagram shows.

"As we can see, this is indeed a complex object. It is an intricate pattern of exotic semi-conducting substances which form the actual circuit. It is produced by a process similar to silk screening, except vapors are used instead of ink. It is a difficult process, and only the fittest few percent survive." He twiddles the focus to get a close up view, which looks like this:



Photomicrograph of a small region of Intel's 8008 8-bit CPU chip.

"That will be all for today. In closing however, I would like to make brief reference to the growing consciousness-raising fad." He eyes the students, alert, yet benign. A few shift, uncomfortable. "Whether with drugs, or meditation, sensitivity or whatever, there is no need for artificial aids to enlightenment," he waves dramatically at the dismembered calculator "when there are such wonders in nature." He smiles. "Thank you, and good afternoon." ■

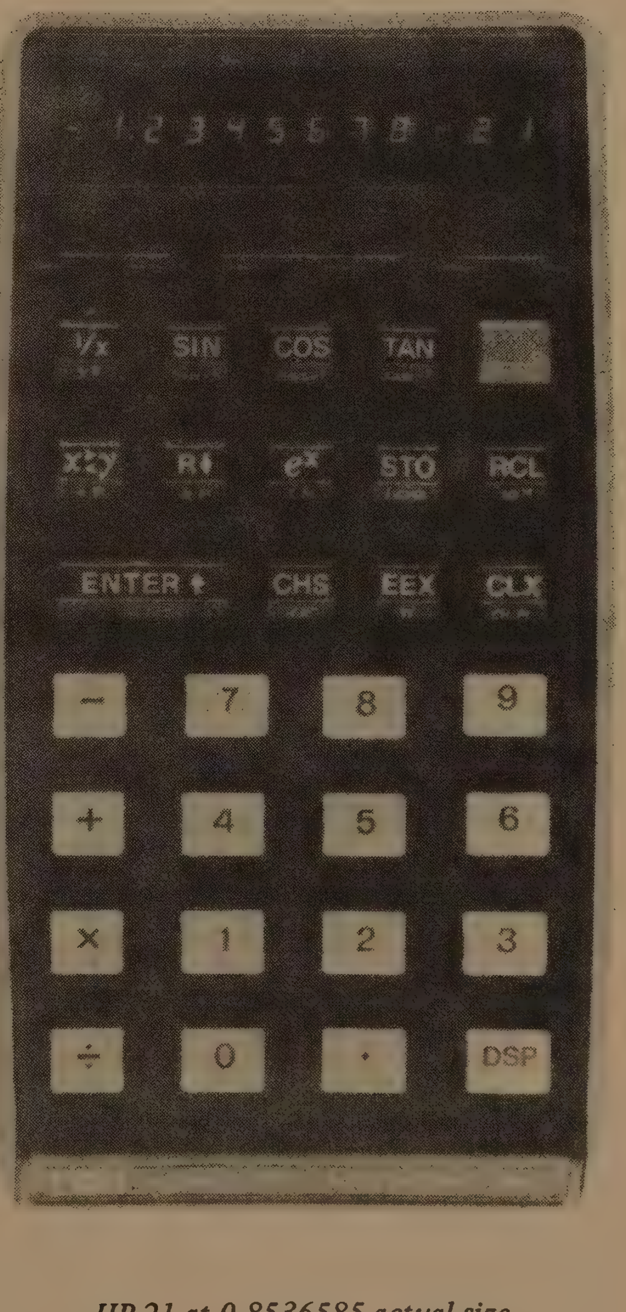
> I will not go so far as to say that to construct a history of thought without profound study of the mathematical ideas of successive epochs is like omitting Hamlet from the play which is named after him. That would be claiming too much. But it is certainly analogous to cutting out the part of Ophelia. This simile is singularly exact. For Ophelia is quite essential to the play, she is very charming — and a little mad.
>
> — *Whitehead*

HP 21

We finally broke down and bought a good calculator recently, and we haven't been sorry. This one utilizes "RPN" (Reverse Polish Notation) which is a system representing equations that enables the machine to automatically untangle complex expressions containing parentheses. Most other machines use "algebraic logic" which at first seems more familiar but requires you to restructure many equations to fit the limitations of the calculator. This can often be confusing, especially if you are not swift with math, which I am not. It took me about two hours to get adept with RPN, and the ease with which it mows down messy problems continues to amaze me. The HP 21 has other endearing features too: the keys click firmly so you're sure when you've pushed one, and you're also sure you haven't pushed one by accident. The lettering on the keys is cast in rather than painted on so it doesn't wear off as on so many others. There is a waterproofing layer under the keys so spilled coffee won't kill your little helper. If you do a lot of calculating it may well be the best buy around. (If you don't do trig or logs, you don't need anything like this. We saw a Remington 4-function plus square root and % the other day for $16.95.)

— J. Baldwin

HP 21
$125.00 with case
and recharger
from:
your local dealer or
Hewlett-Packard
19310 Pruneridge Ave.
Cupertino, CA 95014



HP 21 at 0.8536585 actual size

ADVICE FOR THE COMPUTER-LORN
OR, GETTING YOURSELF A COMPUTER

BY DICK RUBINSTEIN

This paper is a set of suggestions and cautions for anyone wanting to obtain a computer for personal use. There is a wide range of machines, all loosely called "computers," which an individual might be able to afford. First, let me say that if you can afford a $5000 or $10,000 price tag you are in very good shape because you can go out and buy new, commercial computer equipment. My remarks are addressed primarily to those who might spring for $500 to $1000 (the cost of a color TV or a used car). However, even if you are considering the expensive stuff some of what I have to say will be of value to you.

MAXIM: Don't go into this thing blind. Find out all you can about computers before handing over the money!

A primary issue is, "Why do you want this computer, anyway?" If you want to do a moderate amount of numeric calculations for scientific or other technical purposes, then a calculator may be just what the doctor ordered. For example, take a look at the HP-65 or MCM/70. If you like to program, then a calculator will be very unsatisfactory. If you like to piddle with electronics it may not ultimately matter to you whether the computer you get is ever of much use. In any event, if you can sort out your motivations, it will save you money and grief.

Programmable HP-65/Pocket Calculator
(or the HP-55. Similar to HP-65 but cheaper,
$395, no card reader but they throw in a timer)
Hewlett Packard
19310 Pruneridge Avenue
Cupertino, CA 95014
Price: $795 (magnetic card reader built in)

MCM/70 Desktop APL Computer
ILC Data Device Corporation
Microcomputer Systems Division
100 Tec Street
Hicksville, NY 11801

There are many ways to get yourself a computer. Here are some of them:

a) *Buy a used (and likely, old) computer.* This approach is reasonably safe, provided you:

1) *Buy a machine in working condition.* If it is not working, get the seller to agree to make it work for some reasonable period of time after delivery. Working means running the software you want to use (i.e., the FORTRAN compiler or whatever) and the manufacturer's diagnostics.

2) *Get a reasonably modern machine.* If it's got fire bottles (tubes) in it, forget it. If it is big and made from discrete transistors (rather than the more modern integrated circuits), forget it. A 7090, for example, which was once the state of the art, is a bad deal today even if they pay you to take it. I'm not kidding.

3) *Get the prints.* Every computer which has been maintained properly will have a set of circuit diagrams which has been kept up-to-date as modifications have been made to the machine. All manufacturers make updates from time to time. If you don't have up-to-date prints, the machine may be very hard to maintain.

4) *Get the software with the machine.* If it's not available with the machine, get it first or set a large penalty in your contract (!!!) with the seller if the software is not delivered. Bear in mind that you may be unable to tell whether the machine works without the software!

Some machines which may be of interest are PDP-8/I, /L, /e, /f, or /m; PDP-11 (any model); NOVA (any model); HP-2100 series (any model); Varian 620/i or /f.

b) *Buy a kit.* This is only recently a possibility, but there will be more and more kits based on single-chip computers within the next year or two. This approach is not very risky, providing the company is reputable and you know a little bit about electronics. Having put together other electronic kits will certainly be a help. Make sure that you know what you are getting and where help is available (and at what cost) if you have trouble. Minimum machines are great projects which result in fabulous toys, but they may not be very useful. DO NOT buy a machine from a vendor if you must have a peripheral, option, or program which is not yet available. "In development" means "not available".

c) *Buy a commercial micro-computer on a board and build the rest.* If you know a fair bit of electronics and understand how your computer is supposed to operate as a system, this may be a very good bet. Computers-on-a-board are available for a few hundred dollars to over a thousand, and there is an ever-widening range of choices. You should be able to get a full-fledged mini-computer (in terms of instruction set and architecture) this way, by contrast with single-chip computers which are, at the moment, more limited. Don't forget that you will need memory, and that computer-grade power supplies are required to protect the circuitry as well as provide power to it. Also, cabinets, switches, and similar hardware can come to a surprising total if these things are obtained from commercial (rather than surplus) sources.

d) *Buy a computer chip (or chip set) and build the rest.* I recommend that if you take this tack that you get the circuit for a commercial processor board which uses your chip(s) and build your processor exactly as specified. Exactly. All manufacturers of processor chips provide this sort of information, and you will avoid many design and checkout headaches if you avoid being "creative" at this level. When you are done building the processor, you will be at the same point (hopefully) as someone who has bought the commercial board.

e) *Build a processor from scratch.* This approach is certainly the most work. Starting from an established design, you could simply acquire the parts and wire the thing up. This is a reasonable thing to do if you can't afford another approach or if you will just enjoy starting out at this level. A great deal of effort goes into designing a computer. Don't change things unless you are very sure of what you are doing. Also, bear in mind that some computers-on-a-board may be cheaper than their parts bought separately in small quantities. Finally, if you want to design your own machine from scratch, remember that it will take you a long time. It may be very satisfying work, but it will put you a long way from a working machine. If you want to use the machine right away, this is probably the wrong way.

In summary, there are many ways to acquire a personal computer. If programming or use of a computer is your real interest or need, then try to avoid a big construction project. Major sub-goals may mean that you never get to the goal.

A final note on choices: That Personal computer "business" is only just getting under way. You should expect that changes will occur in available home computers which are as dramatic as the changes in the last few years with calculators. There will be major price breaks and vast improvements in the capabilities of small machines offered for sale. Complete integrated systems will become available at moderate prices. You should take the immediacy of your needs into account in timing your acquisitions. For example, if you have computing to do right now, doing it some other way (such as on a commercial time-shared machine) for a while may pay for buying a machine later when the prices and choices are more favorable. ■

Possible inexpensive computer systems

What's the cheapest reasonable computer system? The following possible answer depends on a number of assumptions:

1. You know enough electronics to plug board A into slot B, but not enough to design and build your own interfaces (electronics which adapt a particular computer to a particular input/output device), or use microprocessor chips.
2. You want to get it soon. Prices are generally falling, expecially for the computer itself. Memory prices will be dropping significantly in the next year due to the introduction of 4K memory chips.
3. A 16 bit data word is reasonable. Computers with 12 bit words are sometimes cheaper, but a) are not suited to processing textual information in the usual 8 bit byte format, and b) only allow addressing to 4K (instead of 65K).
4. You can live with problems of dealing with a small company — lack of servicemen, no fancy software; generally on your own. These are well known companies, but generally don't have nationwide service.

I haven't used any of these systems, but have studied the manuals, and they all look like reasonable machines.

Computers

All of these include teletype interface, power fail/restart system (prevents loss of control due to power line interruptions), and a front console with lights and switches for debugging. These three, when sold as options, run about $300-$400 (each). Typical add time is about 3 microseconds. Memory size is 16 bit words (1K is 1,024).

Computer Automation LSI-2

(18651 Von Karman, Irvine, CA 92664) 2 registers, indexing, indirect addressing. Instructions include multiply, divide, increment memory, scan memory. One word instructions. Nice instruction set (168 instr's). Smallest company; don't expect much service.
4K: $2,635 8K: $3,455

Texas Instruments 960A

(Digital Systems Division, P.O. 1444, Houston, Texas 77001) 2 sets of 8 registers. Uses two words per instruction, which is a drag. Other than that, looks good although I haven't seen the manuals for it. Really process-control oriented.
4K: $3,350 8K: $4,850

Data General Nova 2/4

(Southboro, Massachusetts 01772). 4 registers, indexing, indirect addressing. Different sort of instruction set — one generic instruction does all data manipulation. No byte handling, which is a real hassle. Relatively large company. Minimum order 5 (?!).
4K: $4,250 8K: $4,750

Interdata 7/16

(2 Crescent Pl, Oceanport, NJ 07757) 16 general registers; 1 and 2 word instructions (indexing with 2). Instruction set is a lot like the 360's. Good basic instruction set, although nothing fancy like multiply (the 960A and 2/4 can't multiply, either).
4K: $4,250 8K: $4,750

General Automation SPC-16

(1055 S. East St, Anaheim, CA 92805) 8 registers, indexing (and double indexing), indirect addressing. 1 word instructions; very powerful instruction set, with multiply/divide Possibility of a cheaper LSI version coming out. Very informative book, "The value of power," comparing instruction sets.
4K: $5,550 8K: $6,950

Digital Equipment PDP 11/04

(146 Main St., Maynard, MA 01754) 8 registers, indexing, indirect addressing. Nice instruction set; 1, 2, or 3 word instructions, and 8 addressing modes. No multiply, though. Can do stacks and auto-indexing. Largest and best known company; services and software easier to get.
4K: $2,495 8K: $3,295

Interaction

The normal (and cheapest) way to talk to a computer is with a teletype, for about $900 with paper tape reader/punch. An alternative is a CRT terminal (about $1200), which is faster, doesn't waste paper, and is more fun to use. However, you will probably want some kind of printer (and another interface) which runs another $1000 to $2500.

Mass Storage

This is the alternative to paper tape punching. If you are working with large quantities of information (and why else have a computer), it is almost a necessity. The inexpensive way to go is floppy disks, which are relatively new, and look like a 45 rpm record cover. Each 'diskette' holds about 250,000 bytes (i.e., characters), accessed randomly. Cassette tape units cost about the same and hold about as much data, but are accessed serially (i.e. much more slowly). One floppy disk drive, with interfacing and software, costs $2,950 (from Standard Logic Systems, Santa Ana, CA). A second drive (controlled by the first) costs $1,000, and is handy for increased storage and backing-up data from one diskette to another. Nothing like dropping a cigarette on your floppy and loosing six months work! Can't find interfacing to 960A or SPC-16 (although the latter has an expensive [$4,250 single, $1,250 add-on] in-house version).

This is all information I have gathered while trying to get my own system together — I'm certainly not an expert in the field! Some further information:

"The year the mini users shed the security blanket" — Infosystems, January '74. Includes a large comparison table of different minicomputers.

"Focus on minicomputers" — Electronic Design, January 18, 1974. Good article on selecting minicomputers.

"Floppy disk drives and storage" — Modern Data, February 1974.

— Bob Wallace

EVALUATING COMPUTERS FOR HOME OR PERSONAL USE

BY DICK RUBINSTEIN

Let me state my own bias at the outset: In my opinion, computers for home or personal use ought to be evaluated as computers: many microcomputers, suitable for various dedicated applications, are simply not satisfactory for even the most modest of tinkering activities. (This includes all of the 4-bit models.) Stated differently, if you are going to pay for a computer, you should get a machine with the full power of a computer. If you cannot get at the capabilities which are claimed to be there, then you may as well not have them. I believe that conventional mini-computers should serve as a standard for comparison. For myself, I would be very dissatisfied with a personal computer which did not perform at least at the level of available mini-computers. So much for my bias.

A major issue is how large a computer or computer system you will want for a particular use. This is hard knowledge to come by because it requires experience (which is to say, making mistakes — an expensive business). Cycle times, input/output capabilities, and so on will not normally make a great deal of difference, unless your application actually makes a heavy demand on such resources. Generally speaking, the ease of using a computer increases with:

1) The size and quality of the instruction set;
2) The size of the main memory;
3) The capabilities and quality of the available system software, and
4) The quality and capacity of the peripherals.

Without knowing what application you have in mind, I can only make two suggestions.

SUGGESTION THE FIRST: Ask for help. Talk with as many computer professionals as you can find (socially). Join a home-computer group which will put you in contact with people who know. Read everything you can find on the subject. Try not to be fooled by enthusiasm: computers do not solve problems with excitement. Only capability matters.

SUGGESTION THE SECOND (A MAXIM): If you have a specific application in mind and are considering a machine which will leave you tight for memory or speed (such as a minimum Altair system), or if you just want to learn about the capabilities of a particular machine before buying one, WRITE THE PROGRAM BEFORE BUYING THE MACHINE. This may sound silly, but it is worthwhile to do this even if you have no way to see whether the program will work. If you have no particular application in mind, write a demonstration program of some sort to get a feel for the machine's instruction set. Just writing it will give you a much better idea of the capabilities of the machine you propose getting.

REVIEWS

INTEL 8080

This is the chip that launched a thousand ships and which is the heart of the ALTAIR and several other small systems. It is a great improvement over its predecessor, the 8008. If you have a choice between these two chips, choose the 8080, even if it costs you several dollars more (prices for 8080's seem to be $100 or less in single quantities if you look around).

The 8080 is a self-contained CPU with several programmable registers, including a stack register. It generates 16 bit addresses, so the memory does not have to be broken up into little chunks (pages) as with earlier machines, a great advantage in programming. The machine has a large instruction set which includes logical instructions, addition and subtraction in binary and "decimal," conditional jumps and subroutine calls, and a few stack operations.

The worst fault of the instruction set is the way it is presented in Intel literature: Rather than being neatly organized so that the symmetry of related instructions is clear, it is presented as a large number of obviously similar instructions. A manufacturer should be able to say more clearly what its product is.

The 8080 does not have index registers or indirect memory access in the normal sense. Instead, a memory location can be accessed indirectly through a pair of (8 bit) registers. This is less than ideal, but provides some help in indexed or indirect operations.

Electrically, the 8080 requires moderately complex interfacing circuitry. Intel provides several chips which make this much easier, such as the 8224 clock generator (marked "preliminary" in current literature). Without this chip, a two-phase clock must be generated. But the 8080 is much easier to interface with than the 8008, since it has more pins, and thus less multiplexing is required. Also, note that the 8080 chip requires three power supplies: +5 volts, -5 volts, and +12 volts. All buses are directly TTL compatible.

Intel 8080 Microprocessor from Intel Corporation
3065 Bowers Avenue, Santa Clara, CA 95051
(Also available from various "surplus" dealers, and
many distributors such as: Cramer Electronics,
720 Palomar Avenue, Sunnyvale, CA 94086)

MOTOROLA M6800

The M6800 is a recent addition to the growing list of "second generation" micro-computers. It is comparable to the Intel 8080 in terms of speed and size of instruction set. The M6800 chip is a self-contained CPU which performs logical, arithmetic (binary & "decimal"), conditional branches, some stack operations, and so on. Architecturally, the M6800 resembles the PDP-11 mini-computer in some ways: it treats memory and peripherals in the same way, having a common bus. I/O is performed without special I/O instructions — any memory-referent instruction can be used — a powerful approach. The instruction set is more rationally organized than that of the 8080: the manual describes the instructions and each of the addressing modes which can be used with it. In particular, there are accumulator, immediate, direct, extended, indexed, "implied," and relative modes. The indexed mode is substantially better than that of the 8080, providing an offset within the instruction with respect to a register, again similar to the PDP-11.

Both the M6800 and the 8080 are 8-bit machines. The 8080 provides a little more in its instruction set for handling 16-bit quantities, providing "double" length load, store, and arithmetic instructions. The M6800 provides the necessary overflow logic for writing 16-bit arithmetic subroutines, but more instructions would be required. This is not a major flaw. On the other hand, the M6800 provides substantially better interrupt facilities than the 8080. In particular, the M6800 automatically saves the entire context when an interrupt occurs, making it unnecessary for the programmer to write code to do so.

Further, the M6800 has two kinds of interrupts, maskable and unmaskable. This allows the CPU to (temporarily) disable some interrupts, thus creating an interrupt priority scheme. This feature will be particularly valuable in systems with multiple peripherals or faster peripherals (such as cassette tapes, fast printers, etc.).

Electrically, the M6800 competes favorably with the 8080. It requires only one power supply (5 volts), a major saving. Buses are TTL compatible. As with the 8080, a variety of other chips are provided to facilitate interfacing with the rest of the computer system. In particular, there is a clock generator, a Peripheral Interface Adapter (for interfacing external devices: handy), and an Asynchronous Communications Interface (terminal interface), and a modem. Overall, the Motorola M6800 appears to be a somewhat better CPU than the Intel 8080, but these things are a matter of taste. Get the manuals and form you own conclusions.

Motorola M6800 from your local Motorola distributor
Prototype chip set: $300

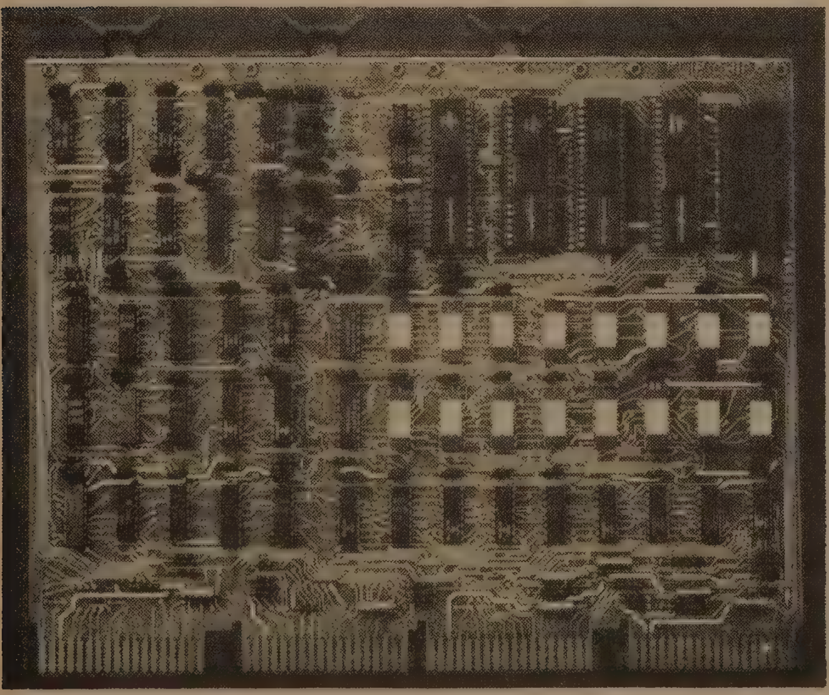
LSI-11

This is a full-fledged PDP-11 computer on a single 8½x10 inch printed circuit board. It executes the PDP-11/40 instruction set at about the speed of a PDP-11/08, and has a floating-point arithmetic option costing about $150. Included on the board is 4K of 16 bit memory. The processor board, including memory, costs $653 in quantities of fifty. Although just announced, Digital Equipment Corporation can be expected to start stamping LSI-11's out in large quantities before very long.

The PDP-11 offers substantially more than many other standard minicomputers. Its architecture, introduced by DEC, is now being widely copied by other manufacturers. Important characteristics are: bus organization in which memory and peripherals have equal logical status, all memory-referent instructions can be used for I/O, large instruction set including many modes and stack-operations. A large collection of software is available for PDP-11's, most of which is compatible with the LSI-11.

For the would-be home-computer owner, the LSI-11 will not be immediately available, since someone will have to buy them in quantity for resale to this market. But the LSI-11 sets a standard of quality and price. If the processor and the first 8K bytes of memory for your home system, without power supplies, front panel, etc., are going to cost you anywhere near $1000, you are probably paying too much for too little. ■

LSI-11 Microcomputer
Digital Equipment Corporation, Components Group
One Iron Way, Marlborough, MA 01752



Experimenter's Computer System

One of the healthiest developments in the world of computers is the growing number of people who just want to get their hands on a real, working computer and play with it. "Computer Professionals" view this kind of activity as some kind of dangerous perversion. They are right.

Amateur computer activity is a perversion which exposes the Professionals' original sin, which was to cloak their playthings with such sanctimoniousness as to make other mortals stand in awe of them. Thus, whatever they ran through their machines was "computerized" and immune from all criticism, no matter how oppressive or inefficient the result.

Now the amateurs are coming out of the woodwork and spoiling the whole game. The near-mythic beasts are being made to cavort to order in back-yard circuses. The secret is blown; you don't need to have a degree or a lot of money or a suit and tie to make a computer do things. Anyone can find out first hand that they are smarter than any machine.

This is made possible by the development of the state of the art of computer hardware to the point where the "thinking" portions of a computer have been reduced to the size of a domino and are sold for less than fifty dollars. These "microprocessors" don't work all by themselves; they need some additional equipment through which to relate to the world and for information storage.

The Experimenter's Computer System ECS-3 *is a book of 68 pages by Carl T. Helmers, Jr., with which it is possible to build, debug and begin programming a computer built around the 8008 microprocessor. Helmers, through his M.P. Publishing Co., has been writing and selling electronic build-it-yourself booklets for a few years.*

M.P. has a kit of parts and printed circuit board available to make construction of the MCS-3 easier, and other publications in the series deal with building some of the "peripheral devices" such as cassette tape data storage, memories, and keyboards which will be necessary to make the MCS-3 more useful.

Even so, this is no project for an individual with no experience in digital hardware;

> *". . . Verify the output of the select flip flop as a square wave with fixed phase relative to the trigger pulse used." (checkout instructions, p. 21)*

If you don't know what those terms mean and don't have the equipment to do it with, you had better get together with some other people who are willing to learn as a group from people who do.

This is a learning project more than a construction project. The hardware itself is somewhat limited in usefulness and clumsy, much like a trainer aircraft. But it's available and forgiving, so that you will have to learn a lot of different things before you begin to sense the limitations. At that point you can either consider your computer education complete or advance to more sophisticated equipment.

— Lee Felsenstein

Experimenter's Computer System
(Series ECS-1 through ECS-8)
1974, 1975
$2.50 /issue
($11.00/6 issues;
$21.00/12 issues)

from:
M.P. Publishing Co.
Box 378
Belmont, MA 02178

This article, part 3 of **The Experimenter's Computer System** concerns the most important subsystems of the design: the Microcomputer CPU and Bootstrap logic. This subsystem includes the Intel 8008 microcomputer CPU chip, clock generation logic, data bus control and buffering logic, interrupt and single step logic, panel displays, and a 256 by 8 memory page with dual ports for manual or CPU controlled operations. The design is self contained and requires no additional peripherals or other computer hardware to check out and run simple programs.

SOFTWARE

Software is the "something extra" that makes the whole thing go. It is intangible, ephemeral. At the same time it is the difference between a pile of electronic junk and an effective, running system. It is to hardware as the script is to the actors, the recipe to the kitchen, and perhaps the mind to the body. Its development has been largely controlled by business and the military, and it is the field of study of a growing science. It is the way our intentions concerning the behavior of the machine are represented. It is the software which determines whether the system is human or inhuman, personal or impersonal. There is a great need for more software that is of utility to individuals, encourages our growth, or is just plain fun. A few examples:

— Marc Le Brun

Meat Computer from Gray's Anatomy

SOFTWARE FOR PERSONAL COMPUTERS

BY DICK RUBINSTEIN

If you are going to be doing any serious programming at all, the software which comes with or is available for the computer you buy is more important than its speed or internal architecture. What use is your machine if you have trouble getting it to do things? Poor system software (or worse, no system software) can make it hard or (in a *de facto* way) impossible to do what you want. Good software makes simple things easy.

"Just because my home computer is of modest size, does that mean that the programming language I use in it must be dumb?" A resounding "NO!" Here are some reasons:

1) **Multiple languages:** There can be several programming languages available for home computers. A task which is difficult to do in one language may be much easier in another. Being forced to use an inappropriate language makes it harder to program, and thus makes the machine more limited.

2) **Shortage of memory:** On larger computers, many languages use large amounts of main memory compared to that available on a home machine. But on large systems, this memory is readily available and is therefore used to good advantage: it is used, in part, to gain processing speed. Since home systems do not have to provide high-performance service to a lot of users at once, they can be programmed to operate at lower speed, with corresponding savings in memory space. It is far more satisfactory to have a somewhat slower language with a full set of features than a stripped-down version which is hard or impossible to use, whatever its speed.

3) **Unity:** Good system software can go a long way towards making any machine more friendly. The amateur computer-user is in a difficult position because he does not necessarily know what he can expect from the software supplied with or for his machine. What services should loaders, assemblers, debuggers, and language processors provide? A well-designed computing system provides a full set of compatible software aids. Acquiring these tools piecemeal from various sources may make the overall system awkward or even unusable. Not only are compatability standards required, but a common use philosophy is very desirable.

4) **Tools:** With careful design, a system can be built on top of a relatively few software aids. These include:

a) Subroutines for commonly used functions such as multiplication, accessing files, moving strings of characters, storage allocation, and input/output operations.
b) An implementation language which helps implement both programming languages and user programs.
c) A debugging package which allows controlled running of assembly language programs while they are being checked out.

With the above considerations in mind, consider the following set of suggestions for a minimum acceptable set of system software for a personal computer system:

A. Assembler

The assembler is the program which converts symbolic names of instructions into machine language. A good assembler is essential to implementing higher level languages. Important features are: symbolic operation codes, locations, and user symbols; free format; symbol table listing; output compatible with loader and debugger.

B. Loader

The loader is the program which takes the output of the assembler, or compiler and loads it into the computer's main memory, linking routines together, so that they can be executed. Important features are relocation and compatibility with the assembler & debug package.

C. Debugger

The debugger is a program which can be loaded with the users machine-language program to facilitate testing. The debugger allows controlled execution of the program under test, and examination and modification of memory locations. Important features are: ability to load a symbol table from the assembler; use of symbolic operation codes and location names; break-points; and ability to operate while interrupts are enabled in the system.

D. Numeric programming language

This is a program which makes it possible to write instructions for the computer in a high-level language. Numeric languages are best for scientific, number-crunching uses. Interactive languages are substantially easier to use on a small system, and thus it is strongly recommended that the language operate in this mode. Possible alternatives are:

1) BASIC with standard Dartmouth College features, plus strings, and immediate ("calculator") mode operations.
2) APL (some reasonable subset)
3) Joss (an interactive language developed at RAND Corp.)

E. Non-numeric programming language

Non-numeric languages are appropriate for symbolic processing of information. They are best for writing programs which involve little actual arithmetic, but which deal with text or relationships between data. For example, game programs, information retrieval systems, and language processors (such as compilers and interactive programming systems) are usually easiest to program in non-numeric languages. Possible alternatives for the home computer user might be:

1) TRAC, a string processing language which is particularly good with limited memory.
2) LOGO, a language designed for teaching children to think using computers
3) LISP, a list-processing language used widely in artificial intelligence research
4) SNOBOL-3, a string processing language which has been used, for example, for text processing (i.e., printing form letters), generating musical scores, and writing poetry.

F. Keyboard-oriented monitor

This program stays in memory while other programs are being run. It provides services to running programs, such as allocating memory and accessing I/O devices. It provides continuity of user control between runs of other programs, making it unnecessary to manipulate the computer from its front panel every time a different program is to be run. A suitable monitor should allow: saving and resuming programs on/from bulk-storage peripherals, if available; interrupt and continue running programs; servicing interrupts, thus simplifying application programs; maintaining the file system on bulk-storage devices. ■

> **Three statisticians went rabbit-hunting. When a rabbit came into view, the first statistician shot at it, overshooting by about a foot. The second statistician took a shot and undershot by a foot. The third statistician cried, "We got him!"**
>
> *– Gregory Bateson*

[sent by Judy Van Slooten]

Micro-8 Newsletter

Micro-8 News is a grassroots publication by and for those who are doing it themselves. Published by the Cabrillo High School Computer Center.

– Marc Le Brun

Micro-8 Newsletter
$6.00 /six issues
from:
Micro-8 Computer User Group
Cabrillo Computer Center
4350 Constellation Road
Lompoc, CA 93436

REPORT ON MY VISIT TO INTEL

I made an appointment and dropped by Intel on Dec. 27. They were interested in our group, helpful to the extent that I received copies of all of their publications, uninterested in helping out the group in any significant way, unwilling to part with diagnostic software or give us access to their program library, and totally unwilling to talk about quantity purchases although I was told that we should put together a package of items we wanted in quantity and then talk to the district distributors. I received a very nice tour of their design and manufacturing facility. Since a very high priority need is system checkout diagnostic programs, I especially tried to obtain them and would you believe they said they don't have any!! How do all of those chips get tested and their Intellec 8's and 8-80's??

●

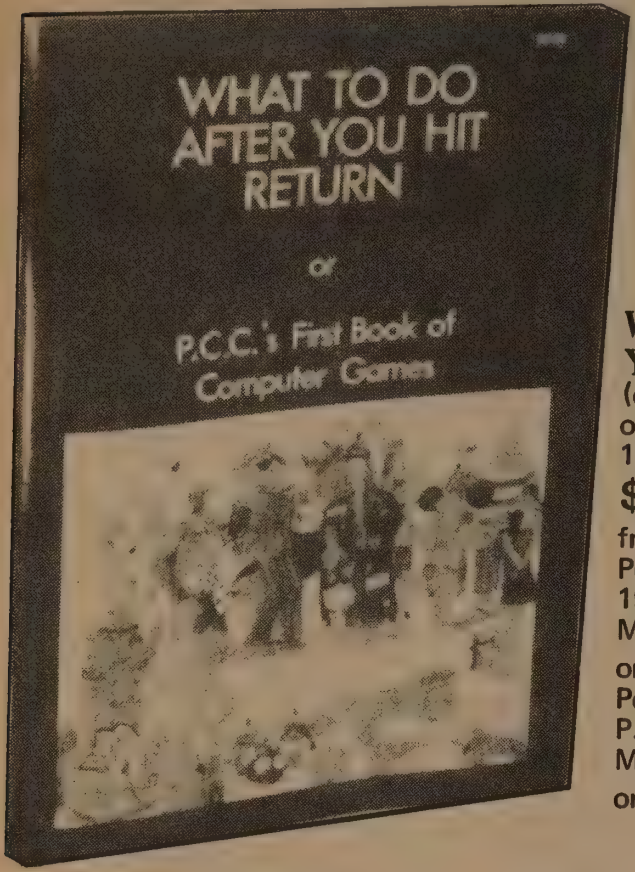
STANDARDIZATION PROPOSAL

Everyone says let's standardize but no one will say what to! About Jan. 10, I decided to face the problem, and proposed a partially thought out list of possible peripherals and what they should cost and a list of I/O assignments. This was intended as something that participants could "throw rocks" at in an attempt to get some dialogue going in the direction of standardization. This was sent out to about 50 of our most active participants and other interested parties.

What To Do After You Hit Return

Being one of the multitudinous contributors to this book, I will limit my comments to saying that this is one of the best books on computer gaming around. Lots of games, lots of graphics, lots of info. People's Computer has grown to the point where it has split, amoeba-like. There are two sources.

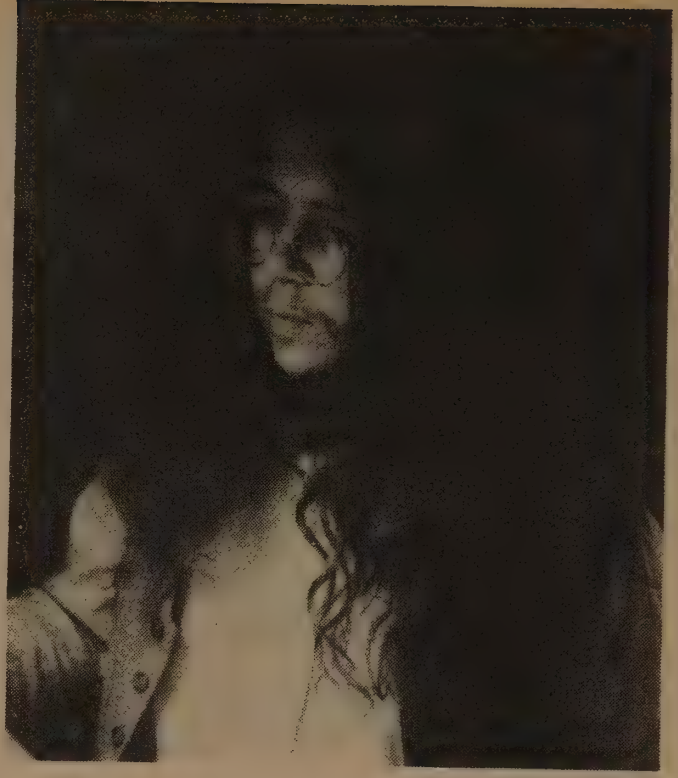
— Marc LeBrun


WHAT TO DO AFTER YOU HIT RETURN
or
P.C.C.'s First Book of Computer Games

What To Do After You Hit Return
(or P.C.C.'s First Book of Computer Games)
1975; 168pp.
$6.95 (50¢ postage)
from:
People's Computer Center
1919 Menalto Avenue
Menlo Park, CA 94025
or
People's Computer Co.
P.O. Box 310
Menlo Park, CA 94025
or Whole Earth

You can't go through a room with a hazard, right? How would you tell if the WUMPUS was sleeping soundly, surrounded by hazards?

•



Last Pass

i been tryin' to write down just what it is
'bout these damn computers, all day now
and each time i get into it
i begin to hear the DNA chucklin' in my
chromosomes
and, if i listen, the whisper of my particles
changing quantum states
here's how i see it:
this ol' computer
gonna go process me some dreams

— Marc Le Brun

KING

Congratulations! You've been made premier of Setats Detinu, a small communist island 30 by 70 miles long. Your job is to decide the country's fate.

Sound familiar? see Hamurabi →

The money system is rallods. Each countryman must have at least 100 rallods/year to survive.

Your country's income comes from farm produce, tourists, and taxes. Half your land is farm land which may be sold to foreign industry who import and support their own workers.

Crops cost between 10 and 15 rallods per sq. mile to plant, and they bring in between 45 and 65 rallods per sq. mile.

Big decision. Should you let industry into your clean, peaceful country?

Industry will buy land from 95 to 105 rallods per sq. mile, and will pay taxes of 44 rallods per sq. mile of land. Industry brings tourist trade. It must own at least 2 sq. miles before you get any tourist trade, and income from your tourist trade will increase until industry owns 26 sq. miles of land.

Pollution is double trouble

Industry also brings pollution, which is measured in units. Pollution may be combatted by spending .44 rallods per unit of pollution. Pollution will decrease tourist trade and crop yield.

A new wrinkle →

You can increase your crop yield through education. The value of crops is dependent on the amount of money used for education in the past 3 years. 10 rallods per person is the maximum useful amount to spend on education.

Your goal: to complete your 8 yr. term. Good luck!

You have 69672 rallods, 506 countrymen, and 2000 sq. miles of land. This year industry will buy land for 98 rallods/sq. mile. Land currently costs 12 rallods/sq. mile to plant.

How many sq. miles to sell to industry? 0
How many rallods to distribute to your countrymen? 50,600
How many sq. miles to plant? 1,000
How much to spend for education? 5,060

1 countryman left the island. You harvested 1,000 sq. miles of crops, making 42,000 rallods. You received 0 rallods from taxes on industry.

You have 44,012 rallods, 505 countrymen, and 2,000 sq. miles of land. This year industry will buy land for 98 rallods/sq. mile. Land currently costs 14 rallods/sq. mile to plant.

How many sq. miles to sell to industry? 0
How many rallods to distribute to your countrymen? 50,500
Only got 44,012 rallods left!
How many rallods to distribute to your countrymen? 42,000 ←
How many sq. miles to plant? 1,000
Only got 2,012 rallods left! ←
You can afford 143 and have labor for 1,010 and have 1,000 sq. miles. ←
How many sq. miles to plant? 143
How much to spend for education? 100
Only got 10 rallods left!
How much to spend for education? 10

Error Messag

85 countrymen died of starvation. You were forced to spend 765 rallods for funeral expenses. 9 countrymen left the island. You harvested 143 sq. miles of crops, making 7,293 rallods. You received 0 rallods from taxes on industry.

This adds insult to injur ←

You have 6,528 rallods, 411 countrymen, and 2,000 sq. miles of land. This year industry will buy land for 97 rallods/sq. mile. Land currently costs 11 rallods/sq. mile to plant.

Notice how the prices vary ←

How many sq. miles to sell to industry? 178
How many rallods to distribute to your countrymen? 41,100
Only got 2,3794 rallods left!
How many rallods to distribute to your countrymen? 23,500
How many sq. miles to plant? 822
Only got 294 rallods left!
You can afford 26 and have labor for 822 and have 822 sq. miles.
How many sq. miles to plant? 26
How much to spent for education? 1
How much to spend to combat pollution? 1,000
Only got 7 rallods left!
How much to spend to combat pollution? 7

176 countrymen died of starvation. You were forced to spend 1,584 rallods for funeral expenses. Over one third of the population has died since you were elected to office. The people (remaining) hate your guts. You have been assasinated.

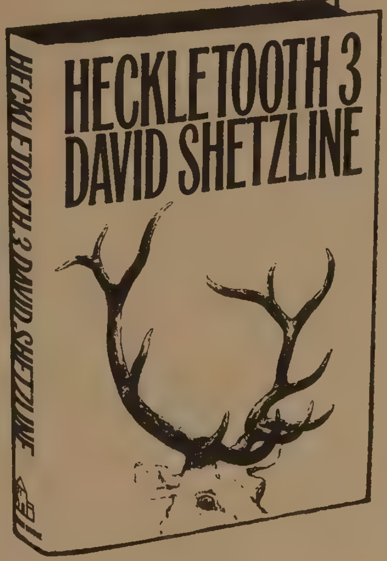
Rest in peace

Heckletooth 3

There are some writers and books that I only hear about from other writers. William Eastlake is one. So is David Shetzline, notably for his forest fire novel Heckletooth 3. *Ken Kesey went on about it to me years ago. And last week Don Carpenter firmly put the book into my hand. Well they've got my agreement. My summer logging the Oregon woods tells me that Shetzline has the work right, the fire and the men right. He especially has the language — Oregon laconic. It's an introspective action-novel about virtue. I mean, about detail.*

For a similarly fine movie, see Sydney Pollack's The Yakuza, *starring Robert Mitchum.*

— SB
[Suggested by Ken Kesey
and Don Carpenter]



Heckletooth 3
David Shetzline
1969; 304pp.
$5.95 postpaid
from:
Random House
457 Hahn Road
Westminster, MD 21157
or Whole Earth

He was exempt now, to a degree he had never before imagined, in a way that gathered all his anger. He felt huge with strength and cunning. He loped back toward the Heckletooth trail, quartering among thickets of brush, graying masses of old wind-split growth; imagining it must be upon his head, a mark — a great fuck-you sign riven to his face in a tetanus grin. *I shall have to be easy now, I shall have to go easy . . . All in all it was a beautiful day, and with some decent luck . . . I shall not lose this time,* he thought. *This time I shall not lose.*

●

"LISTEN!" McGill's call held them. Mechling watched the brown eyes turn to holes shot in wet leather, the voice come from the chest all the while the sound behind the bright store teeth was a disk jockey drowning in adrenalin. "There's got to be laws. And the men who break them, why, they've got to be changed so they never never break them again. Otherwise, why, we might as all well be a bunch of drunken Indians out here running cock-naked in the brush killing and corn-holing and worshiping hell knows what. Men — and I don't mean you or me or the Doc here — but those guys up working the line, why, they're little children, you know that. They got to be kept in firm and babied along and never, never, allowed to break the law without having to admit it and promising never to do it again. And that's why I got to get ahold of that poor bastard what did this. I got to save him so he won't do nothing worse. You think for a moment I give a red shit for this goddam mess of meat? You think a moment it makes any difference the poorfarm gets an extra four, five hundred pounds elk meat? Christ, they'd be better off eating oatmeal anyhow: cheaper to serve and easier on their puckerstrings shitting it out. No . . . No, that ain't it. It's that the man who did this has got to be convinced he done wrong. Then we got him. Then we really got that bastard."

Mechling thought: He's mad. As quickly: No, absolutely logical. Then: What's the difference?

Allen Verbatim

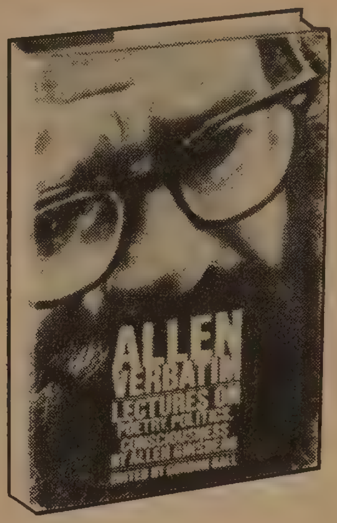
For friends of Allen Ginsburg, here's how he says it, off the top. Spring of 1971, taped. On a variety of subjects he keeps close: consciousness, drugs, politics, poetry. Heady stuff he keeps grounded.

To the Wisconsin State University Epistemology Class: "Well now, look at the gaps in between thoughts. Which means that you have to actually literally examine thought — not get lost in it. In other words you don't become part of thought and get swept away in it, like a boat. You get out of the boat and examine the nature of thought itself, and that I suppose is true epistemology."

And with poet Robert Duncan, a description of their first encounter and the irreversible direction of modern writing. (See below.)

— JoAnne Kyger

Allen Verbatim
(Lectures on Poetry, Politics, Consciousness)
Allen Ginsberg
Gordon Ball, ed.
$8.95 postpaid
from:
McGraw-Hill Book Company
Trade Order Service Dept.
1221 Avenue of the Americas
New York, NY 10020
or Whole Earth



I walked into the room where Robert was teaching — Michael McClure was sitting there looking really beautiful, also — and brought **Empty Mirror** to Robert, and Robert later brought it back to a little room in North Beach where I was staying, and I had pinned on a wall a set of instructions from Kerouac on essentials of prose composition, I think "Essentials of Modern Prose," which are reprinted in the Don Allen anthology, which outlined like "Speak now, or ever hold your peace, write whatever comes to mind, adding vowels, adding alluvials, adding to the end of the sentence, and then rather than revising, if you have a new thought, go on to articulate it in the next sentence."

So Robert looked at the page I had tacked to the wall and said "Oh, who wrote that?" And Robert I think was the first person who recognized the high literary quality of Kerouac's instructions. I was sort of astounded that he had the same insight, 'cause I still hadn't quite got it straight — that you had to attend to what you were saying, because you couldn't say it twice . . .

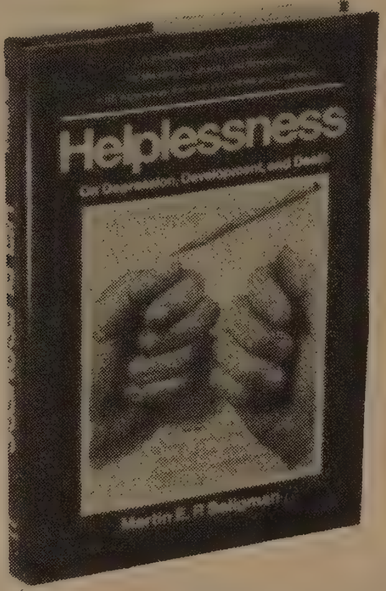
. . . What that kind of writing proposes is an absolute, almost Zen-like, complete absorption, *attention* to your own consciousness, to the act of writing, to a focus of mind, so that attention does not waver while writing, and doesn't feed back on itself and become self-conscious — but that you are attentive to the object you're describing, whether it be the consciousness that is in the room at the moment or your own head, just as long as you don't get feeding back, "I am writing because I am writing I am watching myself writing while I am writing," which would be the great wavering of attention, which most young poets begin with, actually, you know, their first spontaneous thing is, "Gee, I'm writing. What does it feel like? Isn't it weird that I am writing while I am writing and here I am writing, and the ink is blue." Which is everybody's first poem, I guess. It's the archetype poem. But there's a lot of people that really get hung up on that first exercise.

Learning

Helplessness

This may be an important book. It offers a place to look for the problem when that hideous vague sense that "something's wrong" begins to grow. "Wrong" may very likely be that someone feels helpless, and the more they feel that way, the more they act that way, etc. on down. Positive feedback. Through experiments and anecdotes, Seligman shows how helplessness is learned, how it can be unlearned and even prevented. Not much gimmickry here. The book is about situations and their improvement.

— SB



Helplessness
(On Depression,
Development, and Death)
Martin E. P. Seligman
1975; 250pp.
$4.95 postpaid
from:
W. H. Freeman and Co.
660 Market Street
San Francisco, CA 94104
or Whole Earth

When the babysitter arrived for the first time, I introduced the babysitter to Amy; then when they were engrossed in playing, my wife and I sneaked off. Our fading away, we hoped, would avoid the traumatic separation, with Amy wailing and protesting, that we knew would otherwise occur. It certainly seemed like the path of least resistance, and it is a course many parents take.

After we did this several times, we noticed Amy's increased anxiety. Kerry then objected to our strategy: "The safety-signal theory has definite predictions about sneaking off."

"How so?" I asked.

"When we leave Amy with no clear warning signal, that's just like unpredictable shock," she said. "Amy is beginning to spend a lot of time in anxiety about separation, since she has learned that there is no predictor of leaving and therefore no predictor of our staying around. If, on the other hand, we go through an elaborate and explicit departure ritual, then Amy will learn that if the ritual hasn't occurred she doesn't have to worry."

This made a great deal of sense to me, so the next time, we told Amy at length that we were going out for a few hours, took her and the babysitter out to the car, waved bye-bye, exchanged hugs and kisses, and let them watch the car drive away. Amy understood enough of what we were doing to scream and protest, but we did go, and have followed this ritual ever since. Soon thereafter, Amy went back to being placid. Incidentally, Amy at age five is a calm child, who does not seem at all worried about her parents leaving her. The reader may ask where our experimental control is. Actually, since we now have another child of appropriate age, we could provide a "sneak off" control. But since the procedure appeared to work so well, I don't think we will.

Operators and Things

I've become an avid fan of narratives written by schizophrenics (especially, as it happens, by schizophrenic ladies, who seem to be more prolific than their brothers) and this is my favorite of them all. Miss O'Brien knows and shows what too few psychiatrists seem to realize: that a psychotic break, far from being the illness, may be the process by which the illness is healed; and more, that madness may engender a deep wisdom that we "sane" ones are never driven to attain.

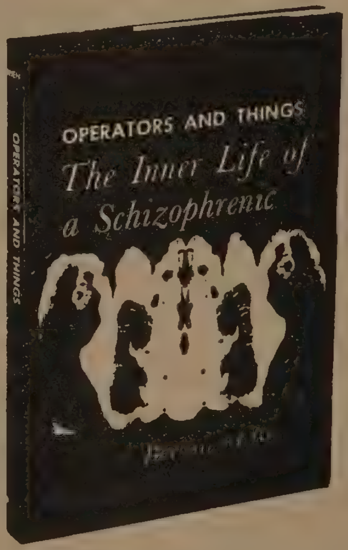
She falls one morning into the hands of the Operators, who prod and prey on us all, as they tell her, but are visible to her eyes only. For six months she travels around the country on Greyhound buses, captive of the Operators, who push and pull, torment, confuse and exhaust her. And at the end of her time of madness, she understands precisely what had been happening:

> [Your mind] *may, with each passing day, tear you to smaller and smaller pieces. It may, on the other hand, patiently stitch together the segments of you that have split apart.*
>
> *That I was one of the lucky ones who went through the processes of self-cure gives the story of the Operators certain values. Sharp, Hinton, the Hook Operators, even the Spider as he scalloped out the lattice-work, were busy at the job of healing a rift in the mental machinery. They were strange gangsters to have been engaged in a constructive enterprise, but the unconscious which devised them had several things in mind, not the least being a desire to hold the interest of the customer in the box seat.*

Her insight is penetrating and irresistible; this is a very wise lady indeed. I finished the book in delighted awe at having witnessed such an intelligently heroic struggle with health, refreshed and encouraged (for a change) about the profundities of the human soul. It's like watching a tree grow green and inexorable from a crack in asphalt.

And it's not just the narrative; her writing is delectable. She displays the gut-wrenching humor and pungent metaphor that seem to be sometimes among the compensations for schizophrenia. Her style is densely eloquent, eminently readable. I recommend this book enthusiastically to anyone who is or has ever considered becoming a human being.

— Judith Van Slooten



Operators and Things
Barbara O'Brien
1958, 1975; 166pp.
$6.95
from:
A.S. Barnes and Co.
Box 421
Cranbury, NJ 08512
or Whole Earth

Once they appear, the dry beach speedily gets the general drift: either you do what these characters say, or else, for no other human can help you. (I remember that one night I brought up the question of God versus Operators. And after a short pause, the boys brought in Sophisticated to explain the situation to me. Sophisticated being the character he was, I lost track of my original question within a short time. But Sophisticated remained with the subject long enough to explain that Operators, very early in the history of civilization, had surrounded the earth with an airfield of steel rays so powerful that even God couldn't get through. As arguments went, I thought that this was a pretty weak one. But, Sophisticated had pointed out, it was quite plain from the state of the world that the steel rays were undoubtedly keeping God out. And I finally had to admit that Sophisticated had a point.)

Magic

In your coverage of hobbies, you left out magic tricks, although **The Great Escape** (EPILOG p. 733) has some good coverage of the subject. For the reader just getting started, I'd suggest **Magic Digest** by George Anderson. Adult, readable, and well-illustrated, it appears perfect for the beginner's needs. Once you've gone through this book, you may want to order some magic equipment. The largest dealers are Louis Tannen, Inc. and Abbott's Magic Co. Both of their catalogs are excellent, though sometimes fall victim to the supersell kind of jargon.

By this time, you may want to move on to more advanced magic, which you can get by joining the International Brotherhood of Magicians. In addition to club meetings and conventions, you get **The Linking Ring**, a monthly magic magazine. Other good magazines are **Genii: The International Conjurors' Magazine** and **The New Tops** (which is published by Abbott's at $7.00 a year).

— Robert Bowie
Anderson, South Carolina

Magic Digest
George B. Anderson
1972; 288pp.
$5.95 postpaid
from:
Digest Books, Inc.
540 Frontage Road
Northfield, IL 60093
or Whole Earth

Catalog
$2.00 postpaid
from:
Louis Tannen, Inc.
1540 Broadway
New York, NY 10036

Catalog
$2.00 postpaid
from:
Abbott's Magic Co.
Colon, MI 49040

International Brotherhood of Magicians
Kenton, OH 43326
Write for an application. Also, you might try looking in the phone book, as they have branches in most cities.

Genii: The International Conjurors' Magazine
W. W. Larsen, Jr., editor
Box 36068
Los Angeles, CA 90036
$8.00/yr (monthly)

•

Magnetism

Here's a quickie that's hard for a spectator to explain. You tell him about your magnetic powers, and ask him to hold out either hand.

You grasp his wrist in your left fingers and close his hand with your right hand, forming it into a fist and then rubbing it vigorously. When you've done this for at least a full minute, you ask the spectator to open his hand. As he does so, you touch each of the fingers with your right forefinger and then touch the forefinger to his palm and lift it.

The spectator will admit that he feels an electric shock or a magnetic pull.

Why? All the time you're rubbing his fist, you're squeezing his wrist with your left fingers. When you lift your forefinger from his palm, you also release the pressure on his wrist. Blood circulation in the hand has been cut off, and the sudden rush of blood to the fingers is responsible for the magnetic or electric effect.

— *Magic Digest*

Encyclopedia of Sex Drugs & Aphrodisiacs

A lovely booklet, mixing plant chemistry and human love-making. Careful and clear, each commentary corresponds closely to my own experience. An honest booklet: how to avoid rip-off prices of Tabloid sex-drug advertising; how to use hormones, plant preparations, and drugs; where to buy some of the aphrodisiacs. (I wonder why LSD is not included. Besides cocaine, this is the most obvious chemical-glory-fucking around.)

— Peter Warshall

Encyclopedia of Sex Drugs & Aphrodisiacs
Adam Gottlieb
1975; 96pp.
$3.75 postpaid

from:
Twentieth Century Alchemist
P. O. Box 4858
San Francisco, CA 94101
or Whole Earth

Cooking With Cannabis

From the author of Cannabis Alchemy *and* Legal Highs *(EPILOG p. 497), comes the best book written on cannabis cooking. Hot buttered Bhang, Majoon, Marrakesh White Cookies — enough to make the mouth water and the mind lightly pass away.*

— Peter Warshall

The Art & Science of Cooking with Cannabis
Adam Gottlieb
1975; 80pp.
$3.75 postpaid

from:
Twentieth Century Alchemist
P. O. Box 4858
San Francisco, CA 94101
or Whole Earth

Hot Buttered Bhang

In a saucepan melt half a cube (1/8 pound) of butter or ghee. Crumble a good handful of marijuana tops or leaves (1/3 - 1/2 ounce). Stir the grass into the molten butter. Continue stirring over medium heat for one minute. While hot and sizzling add 8 ounces of vodka. Be cautious that the hot butter does not make the mixture spatter. It is best to pour in the vodka swiftly. Continue to boil for 30 seconds or more, stirring all the while. A pinch or two of powdered cardamon seed may be added during the boiling. . .

This recipe is not only an efficient method of extracting the active resins (hot butter and alcohol) and an excellent medium for assimilation (alcohol, butter and honey), but it also has a delicious and satisfying flavor. It is reminiscent of hot chocolate, but is much more pleasant to drink. It is one of the most swiftly absorbed cannabis concoctions. The effects of the grass may be felt in less than fifteen minutes. Cheers!

Abbott's Modernistic Amputation
Readymade $115
Plans $3

— *Abbott's Catalog*

The Ground Rules of Magic

1. Decide on a style of performance and stick with it.
2. Make your personal appearance indicate the quality of your performance.
3. Never do a trick in public unless you can do it well.
4. Routine your tricks.
5. Never, never, NEVER expose a trick under any circumstances.
6. Amateur or professional, you extend professional courtesy to other performers.
7. Accept prevailing performance conditions.
8. Don't embarrass anyone in your audience.
9. Keep it clean.
10. Never do tricks with dangerous items in front of children.
11. Have a definite terminal point.

— *Magic Digest*

Loka

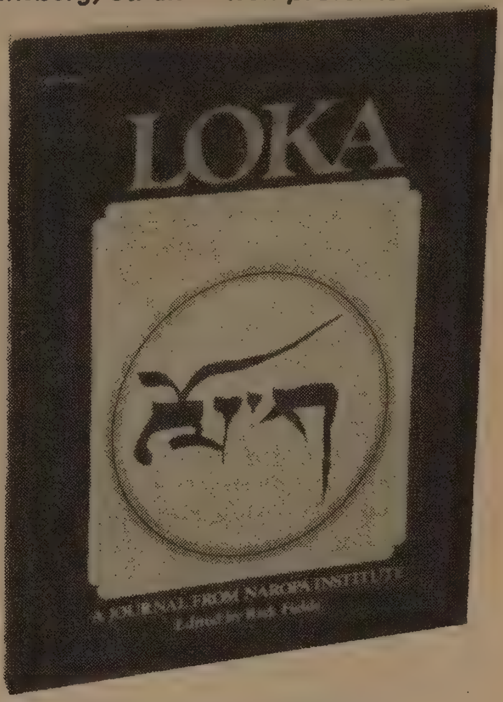
The sometimes religious-editor of The CQ *edited this collection of the good stuff from the amazing first big-time summer (1974) of Chogyam Trungpa's Naropa Institute at Boulder, Colorado. It's a fascinating array — John Cage, Ram Dass, Anne Waldman, Jose Arguelles, Gregory Bateson, Thich Thien-An, Allen Ginsberg, et. al. — well presented.*

— SB

Loka
(A Journal from
Naropa Institute)
Rick Fields, editor
1975; 143pp.

$4.00 postpaid

from:
Anchor Press
Doubleday & Co., Inc.
501 Franklin Avenue
Garden City, L.I., NY
11530
or Whole Earth



You obviously can't afford to look at the universe and forget that there are such things as *kinds*. There is a very strong tendency in America to believe that the universe is not made up of discontinuous, separate kinds.

This seems to be a spiritual semi-truth which can turn into almost cosmic soup.

But a pine tree is a pine tree, and an oak is an oak, damn it . . . .

*

We commit these gross things, the Treaty of Versailles, for example. This was a swindle *about* war, not itself a part of war. If you're going to swindle at the peace table you're in trouble. You can do what you like in war, use all the tricks, but you can't get the other side to surrender, and then put your heel on them. That's cheating, and that's what we did. And we (and they) are going to suffer for that for two hundred years, certainly. The whole international crash is part of that. So we've set one of these trains of distrust, feuding and vengeance going, and we have no idea what the mechanisms are for stopping it. How do you eat up bad karma? And if our Buddhist friends have any real idea how to burn up bad karma on an international level, I'm anxious for it, any day.

— Gregory Bateson

Many Americans wonder why Buddhist monks immolated themselves.

About twenty thousand Buddhist monks, nuns, and professors were in jail. They were arrested by the government and nobody knew. That was an emergency case. I was released from jail by those monks who died, because when those monks burned themselves, then newspapers, magazines, and television and also the United Nations sent an investigation delegation to Vietnam, and I was released from jail one night before the delegation arrived. It is like the Christian martyrs. But in Vietnam it is more meaningful, because only seven monks dying released and saved almost twenty thousand people from jail. In Vietnam we consider the first monk to do that a bodhisattva because he died for his religion and to help us . . . .

In Buddhism the first important precept is not killing, not killing oneself and not killing others. But in such an emergency there was no other way to help. They were using their bodies like a lamp for help.

— Thich Thien-An

A Guide to Oriental Classics

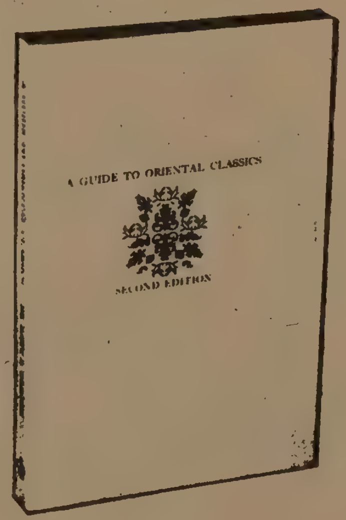
Quite remarkable. A careful, comprehensive survey of everything worthwhile in English translation from the Islamic, Indian, Chinese, and Japanese religious and literary traditions. Dry, verging on wry, annotations.

— SB

A Guide to Oriental Classics
Wm. Theodore De Bary, editor
1964, 1975; 261pp.

$3.50 postpaid

from:
Columbia University Press
562 West 113th Street
New York, NY 10025



THERAVADA BUDDHISM:
THE MILINDAPANHA (*ca.* 1st cent. A.D.)

One of the most important paracanonical prose works of Theravada Buddhism. A dialogue between a Greek king, Milinda (Menander), and a Buddhist monk, Nagasena.

Translations

Horner, I. B. King Milinda's Questions (Milindapanha). (Sacred Books of the Buddhists, vols. 22 and 23.) Vol. I. London, Luzac, 1963.

Rhys-Davids, Thomas William. The Questions of King Milinda. (Sacred Books of the East, vols. 35, 36.) Oxford, Clarendon Press, 1890-94. (Reprinted, New York, Dover, 1963.) A fine translation by a competent scholar.

Secondary Readings

Rhys-Davids, Caroline A. F. The Milinda-Questions: An Inquiry into Its Place in the History of Buddhism. London, George Routledge, 1930. A scholarly study of the text with several original ideas regarding its composition, authorship, and interpretation.

Winternitz, Moriz. A History of Indian Literature. (See above, under General Works, for full bibliographical information.) Vol. II, pp. 174-83. An excellent account of the work with emphasis on its composition and literary qualities.

Mani Trading Co.

Fine religious items (non-Christian). Meditation bells, drums, statuettes, incense, prayer flags, and sweet service.

— SB

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Catalog
$1.00

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Mani Trading Co.
Box 201
Warren, VT 05674

If you've ever scoured Chinatown knick-knack shops for a meditation bell or some really nice incense, or priced a Buddha-statue in an art gallery or from an antiques dealer, or looked over the ones offered in oriental imports shops, you'll understand what Mani Trading Co. is all about.

It's not easy to locate a nice inexpensive Buddha-statue or some subtle temple-quality incense; and articles like meditation bells and sitting cushions are virtually unheard-of.

We've spent a lot of time over the past 5-10 years looking for such articles; and whenever we found something acceptable, all of our friends seemed to want one too. — And one day we realised we were in the oriental-religion-stuff business.

We specialise in things you can't find because they're not "commercial" items. And in things that might be sold commercially, — but either you would not know where to look for them, or the prices are unreasonably inflated; perhaps both.

This catalog is directed to persons on the path, to help them locate useful and pleasant articles.

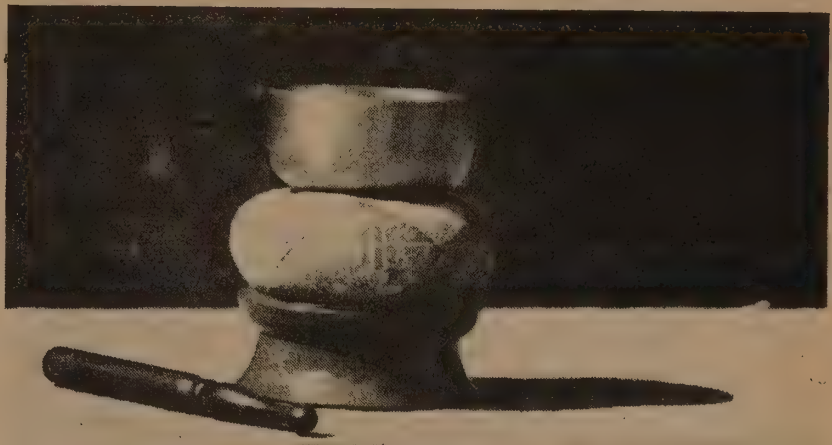
We also act as an outlet for spiritual communities and craftsmen who produce such goods.

And, in light of the plight of the Tibetan nationals who escaped the Communist take-over of their land, we are all doing what we can to preserve the precious teachings and aid the refugee community.

We'll do our best to locate anything you can describe.

•

DHARGEY ZIMPO: This traditional Tibetan incense is made by Thinley Dhargey, a Tibetan refugee. This is the highest quality he makes, and contains musk, saffron, and two kinds of sandalwood among its 32 ingredients. The sticks are red-orange, 13½" long, and burn for about two hours. Price per box of 50 sticks: $3.10.



Home altar Japanese cup-gong — $7

Six Nonlectures

e. e. cummings distilling his own life into finest, headiest liquor. The man tells more news in less words, and more heart with less throb, than anyone else writing.

Life is a high calling, proves this book.

— SB
[Suggested by Russell Troutman]

i: six nonlectures
e e cummings
1953, 1974; 114pp.

$1.95 postpaid

from:
Harvard University Press
79 Garden Street
Cambridge, MA 02138
or Whole Earth

(Sensational listening — the original Cummings nonlectures on Caedmon Records, 515 8th Ave., New York, NY 10018.)

By way of describing my father, let me quote a letter . . .

I wot not how to answer your query about my father. He was a New Hampshire man, 6 foot 2, a crack shot & a famous fly-fisherman & a firstrate sailor (his sloop was named The Actress) & a woodsman who could find his way through forests primeval without a compass & a canoeist who'd stillpaddle you up to a deer without ruffling the surface of a pond & an ornithologist & taxidermist & (when he gave up hunting) an expert photographer (the best I've ever seen) & an actor who portrayed Julius Caesar in Sanders Theatre & a painter (both in oils & watercolours) & a better carpenter than any professional & an architect who designed his own houses before building them & (when he liked) a plumber who just for the fun of it installed all his own waterworks & (while at Harvard) a teacher with small use for professors — by whom (Royce, Lanman, Taussig, etc.) we were literally surrounded (but not defeated) — & later (at Doctor Hale's socalled South Congregational really Unitarian church) a preacher who announced, during the last war, that the Gott Mit Uns boys were in error since the only thing which mattered was for man to be on God's side (& one beautiful Sunday in Spring remarked from the pulpit that he couldn't understand why anyone had come to hear him on such a day) & horribly shocked his pewholders by crying "the Kingdom of Heaven is no spiritual roofgarden: it's inside you" & my father had the first telephone in Cambridge & (long before any Model T Ford) he piloted an Orient Buckboard with Friction Drive produced by the Waltham watch company & my father sent me to a certain public school because its principal was a gentle immense coalblack negress & when he became a diplomat (for World Peace) he gave me & my friends a tremendous party up in a tree at Sceaux Robinson & my father was a servant of the people who fought Boston's biggest & crookedest politician fiercely all day & a few evenings later sat down with him cheerfully at the Rotary Club & my father's voice was so magnificent that he was called on to impersonate God speaking from Beacon Hill (he was heard all over the common) & my father gave me Plato's metaphor of the cave with my mother's milk.

This, I feel is an accurate sketch of Edward Cummings, Harvard '83 — except as regards his neighbourliness. He certainly had "small use for professors" in general; but with the particular professors around him his relations were nearly always amicable and in certain cases affectionate. The neighbour whom my father unquestionably preferred was William James; and it's odd that I should have forgotten to mention so true a friend and so great a human being. Not only is it odd: it's ungrateful — since I may be said to owe my existence to professor James, who introduced my father to my mother.

•

One ever memorable day, our ex-substantialist (deep in structural meditation) met head-on professor Royce; who was rolling peacefully home from a lecture. "Estlin" his courteous and gentle voice hazarded "I understand that you write poetry." I blushed. "Are you perhaps" he inquired, regarding a particular leaf of a particular tree "acquainted with the sonnets of Dante Gabriel Rossetti?" I blushed a different blush and shook an ignorant head. "Have you a moment?" he shyly suggested, less than half looking at me; and just perceptibly appended "I rather imagine you might enjoy them." Shortly thereafter, sage and ignoramus were sitting opposite each other in a diminutive study (marvellously smelling of tobacco and cluttered with student notebooks of a menacing bluish shade) — the ignoramus listening, enthralled; the sage intoning, lovingly and beautifully, his favorite poems. And very possibly (although I don't, as usual, know) that is the reason — or more likely the unreason — I've been writing sonnets ever since.

The Structure of Mystical Experience

BY BROTHER DAVID STEINDL-RAST

I would like to speak about planetary religion in the light of the monk in us: The monk in us is very closely related to the child in us, or if you want, to the mystic in us. And we are all meant to be mystics. We do a great disservice to the mystics by putting them up on a pedestal and thinking of the mystic as a special kind of human being. The truth is that every human being is a special kind of mystic and that creates a tremendous challenge for each one of us to become precisely that mystic we are meant to be. I'm taking here mysticism in the strictest sense as the experience of communication with ultimate reality.

There is in the child a longing to find meaning, an openness to meaning which tends to be lost later on, or overshadowed by our preoccupation with purposefulness. I would like to say right at the outset that when I use these two terms purpose and meaning, that I am by no means playing off purpose against meaning or meaning against purpose. However in our time and in our culture, we are so preoccupied with purpose, that one really has to bend backwards, and overemphasize the dimension of meaning. Otherwise we will be lopsided.

In the child there is also a tremendous curiosity for how things work and a tremendous thrust toward purposefulness, and that is the only thrust that we tend to develop — while there's also this great longing for contemplation which we tend not to develop. The typical gesture of a child in public when you see it these days, is being dragged along by a long arm, and whoever is dragging the child is saying, "Come on, let's go. We don't have any time. We have to get home." (Or we have to get somewhere else.) "Don't just stand there, do something." That's the gist of it, while other cultures like Native American tribes in many cases had an entirely different ideal for education, saying things like, "A well educated child ought to be able to sit and look when there's nothing to be seen," and "A well educated child ought to be able to sit and listen when there's nothing to be heard." Now that's very different from our attitude but it is very congenial to children because that's exactly what they want to do — just stand and look and be totally absorbed in whatever it is that they're looking at or they're listening to or they're licking or sucking or playing with in one way or another. And of course, we destroy this capacity for openness towards meaning very soon, very early in a child's age by making them do things and by making them take things in hand and by directing them very exclusively towards the purpose level.

Maybe I should say just a word more about purpose and meaning and the way in which I use these two terms. But again, I don't want to just impose my definition on you. I'd rather invite you to think about a situation in which you have to carry out a particular purpose and see what the inner dynamics are and then compare this with a situation in which something becomes meaningful to you. When you have to accomplish a particular purpose, the main thing is that you have to take things in hand; if you don't know what it's all about, somebody has to show you the ropes, as we say. This is the idea of taking things in hand, of handling the matter, of coming to grips with the situation, as we say, of keeping things under control, otherwise you're never quite sure that you're going to accomplish your purpose.

Now think of a situation in which something becomes meaningful to you. What is there to grasp? What is there to keep under control? That's not it. You will find yourself using expressions in which you are perfectly passive, or more passive at any rate — "responsive" is really the word. But more passive than in a situation in which you are accomplishing a purpose. You will say, "It really did something to me." Now you are not the one that keeps things under control, and handles them or manipulates them. But it did something to me. It really touched me. Or, if it's very strong, It hit me over the head, It swept me off my feet, something like that. So, what really happens is that you give yourself to it and in that moment, it, whatever it may be, reveals its meaning to you.

Now we may go on to a very important type of experience which Maslow has studied under the heading of the "peak experience," those peak moments in which meaning reveals itself to us. In order to say more about this, it is necessary that I don't talk out here about something that is unrelated to your own experience, particularly since the peak experience in

Brother David, a Benedictine monk of the Mount Savior Monastery at Elmira, New York, here makes what I consider the most lucid statement of the approach to epiphany since Evelyn Underhill's Christian classic Mysticism *(1911, CATALOG p. 431).*

Born in Austria, Brother David has been an unusually effective lecturer and exemplar of spiritual basics for college-age Americans. He is particularly known for his pivotal role in the Houses of Prayer movement, which he summarized recently in a letter to us:

"In 1968 a trend among the roughly 200,000 Roman Catholic religious men and women surfaced explosively. It had been prepared for a long time underground. Members of active religious orders (nurses, teachers, social workers) discovered that their life had gradually become so purpose-ridden that something drastically new was needed to restore its basic meaning. They started to set up Houses of Prayer, 'places where you are allowed to do nothing without having to feel guilty about it,' as Thomas Merton put it. For ten thousands these Houses of Prayer provided time and place for a re-assessment of life, confrontation with ultimate values, exposure to the question 'Who am I?' and 'Why all this rat-race?'

"The whole thing is a grass-roots development – no organized project, no headquarters, no hierarchies. I watched it develop. Was in touch with many different types of Houses over the years. Helped set up a few. Helped set up the first 4-months training program for people who were about to start Houses of Prayer. (No funding whatsoever – we somehow made ends meet – ergo: no strings attached.) About a dozen people were in this program. Most of them founded Houses of Prayer afterwards – all different types. Thus the venture has mothered (and grand-mothered) many others. I keep running into them, but can't keep track any longer.

"My own interest has become more and more clearly focused on the solitude aspect of this movement. Right now I'm experimenting. Since solitude is the topic, the less publicity, the better. I'm exploring possibilities of utilizing abandoned light houses and far out islands for people who feel the need to get away for a limited period of time. Experimentation includes practical aspects like diet, shelter, possible arrangements with park authorities and U.S. Coast Guard. It also includes questions concerning the amount of support one needs from a community to prevent one's being alone to turn into loneliness rather than solitude. I've not gotten far as yet, but I realize that I'm working with the grain of reality, so it feels good and looks promising in the midst of the inevitable pain, difficulties, disappointments."

The following is a talk given last summer at Lindisfarne, William Irwin Thompson's spiritual community on Long Island. With Brother David's help I have edited out some of the repetition and ambiguities inevitable in a casual lecture. The man has a thoughtful, heartful voice, worth hearing direct on Lindisfarne's cassette – $6.50 from Lindisfarne Association, Box 1395, Southampton, NY 11968.

– SB

James Twomey

Brother David and friends in Kansas City.

its matter, in its content, is so very evasive. So in order to be able to speak about it at all, we'd either have to have a poetry session, or a music session, or something like that which is not exactly the type of session which we are having here now. If we want to have a discussion of it, we can only discuss some aspects, some structural aspects, maybe, of this experience, and each one of you will have to fill in the context on your own. And so everything depends now on each one of us really remembering one of those peak experiences. For those of you who may possibly not even be familiar with the term, or who just at this very moment need a little refresher for your memory, simply think of an experience which when you think back on it was a moment of which you could say, that kind of thing makes life worth living. It's a moment in which you are somehow "high," or at any rate, higher than at other moments. And in this sense, it is really a peak. It is a moment. On rare occasions, a peak experience may last quite some time but even then that long time, say an hour or so, appears as a moment. It is always a point in time, if you want to put it this way, just as the peak of a peak is always a point. There's a relatively long ascent and a relatively long descent but the peak is just the point.

So as you look over your day, or over your life, or over any period of time you see these peaks sticking out and they're just points, points of an elevated experience of vision, of insight, if you want. That is also important to the notion of a peak. When you're up on top of a peak you have a better vision, you can look all around. While you are still going up, part of the vision, part of the horizon is hidden by the peak you are ascending. So try to think now of a moment of this kind, and make it very concrete, very specific. No generalities will help us here. It doesn't have to be a gigantic peak. Those gigantic peaks are very rare in our life, but an anthill is also a peak, so anything that comes to a peak will do for our purposes. Just try to remember very concretely an experience in which something deeply touched you, and an experience in which you were somehow elevated over normal level, and then I will make a little pause so that I myself can also think of one of these experiences and then we'll look a little bit into the structure of these experiences. And if these experiences are as it appears to me they are, the epitome of the mystical experience, the type of mystical experience, then even in our little anthill type peak experiences, there will have to be found the typical structure of the mystical experience, the typical structure of that childlike openness to meaning, the typical structure of monastic life . . .

(Pause)

All right. I said that the content of these experiences is very evasive. You try to tell somebody about it, but you can only indicate. You might even have to say, "Gee, nothing really happened." Well, of course, that is a profound insight, because if you allow nothing to happen, that's the greatest mystical experience. As you talk about it, you will find yourself trying to use expressions like, Oh, I just lost myself when I heard this passage of the music, or just lost myself looking at that little sandpiper running after the waves, and then as soon as the waves came the sandpiper runs back, and then the sandpiper runs after the waves, and after you lose yourself for a little while — you are never quite sure again whether the waves are chasing the sandpiper or whether the sandpiper is chasing the waves, or whether nobody is chasing nobody. And then, strangely and paradoxically, and this is exactly what you are aiming at — we are trying to find the paradoxes that must necessarily be in any mystical experience — paradoxically, you find that you would also say about this same experience and under this same aspect under which you say you lost yourself, that for once you were truly yourself. Or you would use the expression, "I was just carried away." You were carried away. It is a poetic expression, because there are certain things in life that cannot be expressed in any other way but in poetic expressions and so these poetic expressions also enter into our everyday language. But then you find again the paradox, because about the very same experience of which you say I was carried away, you would have to say, yes, but at that moment, when I was most carried away, I was more truly present where I am than at any other time.

And that's my problem, that most of the time I am not really fully present where I am, but I'm 49% ahead of myself just stretching out to what's going to come, and 49% behind myself hanging on to what has already passed, and there's hardly any of me left to be really present where I am. And then comes something along that's practically nothing, a little sandpiper, or the rain on the roof, or something like that, that sweeps me off my feet and for one split second, I am really present where I am. I'm carried away and I'm present where I am. I lost myself and I found myself.

I go on to another paradox. If you have chosen one of those experiences in which physically you were alone, you will find that even though you were alone (and paradoxically not so much in spite of being alone, but because you were so truly alone, at that moment) you were united with everything and everybody. If there were no other people around with whom you could feel united, you felt united with the trees if there were any, or with the rocks, or with the clouds, or with the water, or with the stars, or with the wind, or whatever it was. It felt as if your heart were expanding, as if your being were expanding to embrace everything — as if the barriers were in some way broken down or dissolved. You were one with all, at the very moment when you were truly alone.

You may check this out by finding in retrospect, reflecting now on your experience, that you didn't miss any of your friends at the peak of your peak experience, a moment later you may have said, Gee, I wish that so-and-so could be here and experience this beautiful sunset or could see this or could hear this music or something like that, but at the peak of your peak experience you aren't missing anybody, and the reason is not that you have forgotten them,

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if you really reflect on what happened, but that they were there, or that you were where they were, because you were united with all and so there was no point in missing anybody. You had reached that center, if you want, of which religious traditions speak in which everybody and everything converges.

All right, there is a paradox, that when I am most truly alone, I am one with all. You can turn this around. Some of us may have been thinking of an experience in which part of the peak experience was precisely that we felt one with all in an enormous group of people, maybe some liturgical celebration, maybe a peace march, some demonstration, a concert, a play, where part of your tremendous enjoyment is that you feel that everybody there is just one heart and one soul and everybody experiences this same thing. Objectively this may not at all be true, incidentally. You may be the only one who is really turned on like that. But you experience as if everyone was turned on in the same way, and very often this is also true. But, even in this situation (now we turn the paradox around): When you are most one with all, you are really alone, you are singled out as if that particular word of the speaker — if it's some lecture that turns you on — were addressed to you personally, and you almost blush, Why is he talking about me? Why is he singling me out? Or, this particular passage of this particular symphony is written for me and it was composed for me and it was performed for me and such a tremendous lavish performance and it was all for me. And we come to see that paradoxically this is no contradiction. When you are really alone, you are one with all, and even the word alone in some way alludes to that. Possibly, at least, it may serve as a mnemonic device to remember this: All one, one with all, truly alone.

Now I would just like to draw out a third paradox which in some respects is the most important one, and see again if that checks with your own experience. When this peak experience hits you, or lifts you up, or whatever it does to you, in a flash of insight everything makes sense. But in a very different way from finding the answer laboriously to some problem. We think we'll get the answer to the problem . . . well, the moment we get the answer to this problem, several other problems arise, so we think, O.K., we'll follow this other problem up to its end, and we kind of think of ourselves as handing ourselves along from question to answer, new questions arising, to the next answer, to the next answer, to the next answer, and then finally we might arrive at the final answer. But what finally happens is that this chain is a circuit and we go around and around and around, and the last answer is always the first question.

[more →]

In our peak experience somehow intuitively we become aware of the fact that to find the answer, you have to drop the question. Something knocked you over and for a split second you dropped the question, and the moment you dropped the question, the answer is here. And you get the impression that maybe the answer was always trying to get through to you and the only reason why it couldn't get through to you is you were so busy asking questions.

Why should this happen in our peak experience? There seems a grotesque disproportion between cause and effect in this case. I was doing nothing but looking at the sandpiper running after the waves and running away from the waves, I was doing nothing but lying awake and listening to the rain drumming on the roof. Why should suddenly everything make sense?

There is another way of trying to approach this. You might say that what happened to you, if you really try and check out your experience, is that something teased you into saying yes. You see the sandpiper and something in you says a wholehearted yes. Or you hear this rain and your whole being says yes to it. And it's a special kind of yes, it's an unconditional yes. You don't say yes if, you say yes. And the moment you have said an unconditional yes to any part of reality, you have said yes to everything implicitly. You don't have to draw out the lines. You are not analyzing the thing. You have said yes to everything that otherwise you departmentalize into good and bad and black and white and up and down. You're not distinguishing in this sense, you just say yes and all of a sudden this whole thing falls into a pattern and you have said yes to the whole pattern.

Now, if this in any way seems real to you, if there's any response in your heart that says, Yes, that is something that applies to my own experience . . . . that is enough to go on and to show that each one of us has really experienced in some very important moments of our life what it is that makes monastic life tick.

Monastic life is a particular form of life. A monastery is a particular place, and this particular environment could be called a professional environment, a controlled environment, a laboratory, a workshop. In fact, one of the key documents of our Western tradition of monasticism at any rate, St. Benedict's Rule, calls the monastery a workshop. It is a place in which everything is geared towards cultivating that contemplative dimension of which we have been speaking, cultivating that mystical attitude that opens towards meaning, which all of us experience in our peak experience. So all of us throughout our life are in a sense amateurs of the monastic life, and the only difference between us and monks is that monks are professionals. But especially in our time we know that professionals very often are much less good at whatever they profess to do than amateurs are, and so there is not the slightest bit of pride in that. The more people discover how important the monk in them is, and the more they discover how important the openness towards meaning is for them, the more important it becomes that everybody — amateur or professional — has occasionally access to this controlled environment in which they can cultivate the contemplative dimension in their lives.

Now, I'll just very briefly pick out these three paradoxes once more and show how they are really what makes monastic life tick — or religious life, as professional religious life. If anybody has experienced that when I lose myself I find myself, then that person has inner access to the very heart of what a life of poverty is meant to be, because a life of poverty has only one goal and that is precisely to lose yourself, and so find yourself. And everything else that has to do with the life of poverty, everything else you may think of — oh, they have no money, or they have all their money in common and have a lot more money than everybody else, or they must ask permission if they want to use the car, they are only permitted to have so much money in their pocket, or they are not allowed to touch money, and so other people touch the money, in all different monastic traditions, anything that you can think of as phenomena of poverty — are just ascetic means to cultivate that seed which all of us know: I lose myself and so I find myself.

And let's not make the mistake to say I lose myself *in order* to find myself. That is already turning this whole thing into a purpose matter and that's not it at all.

I lose myself and I discover that so I have found myself. And now I spend my life cultivating this seed. And what lies between the seed and the harvest is that ascetical effort in many, many different forms according to the different monastic traditions and the harvest is nothing else but what the seed was, because you never harvest anything but what you sow. That is that you lose yourself and so find yourself — only more so. That's all.

If you take the second paradox, that when I'm truly alone, I'm one with all, and when I'm truly one with all, I'm alone — you have the life of celibacy. And again what lies between the seed and the harvest is simply ascetical effort that can take many, many different forms and is just meant to cultivate this seed so that in the end you have precisely that, namely to be one with all and alone.

One could make a very good case — but I think someone else ought to do that rather than a monk — that married life is exactly another road towards the same goal to be one with all and truly alone. That means one with yourself — that you can stand on your own feet, that you are not just half of a pair, but that you are truly alone and so one with all and not only with your partner, but one with all — it's not an egotism for two.

And now the third paradox of course lies at the root of what we call obedience. The first thing that we think of as obedience is that you do what somebody else tells you to do. Now that's a time-honored and a very helpful ascetical means towards the end, but to get stuck in this would be totally wrong and totally fruitless because if it is just a matter of replacing my self-will with somebody else's self-will, I would rather

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have my own self-will because it is much closer to home. The whole idea is to get beyond self-will altogether, because self-will is the one thing that gets between us and that listening. All our questions, all our frantic looking for solutions is just an expression of our self-will, my little self-will over against the totality. And the moment I drop that and give it up, the whole comes through to me and gives itself to me, when I'm not so intent on grasping it, and grabbing it, and holding it, but when I give myself to it.

Obedience means literally a thorough listening. As the Jewish tradition says, "to bare your ear," the earlocks have to be removed so that you can really listen thoroughly, that's obedience in the Old Testament. In many, many forms, in many, many languages, the word for obedience is an intensive form of the word listening — *horchen, ge-horchen; audire, ob-audire,* many other languages . . .

In other words, obedience often uses as an ascetical means doing what somebody else tells you in order to get over that selfishness, that self-will, that always having your own ideas, and your own little blueprints. It's a means to drop all this and to look at the whole and to praise the whole as Augustine says. But the decisive thing is to learn to listen, and very often doing somebody else's will can precisely be a hindrance to learning to listen, you just become a marionette. And this is very important in the context of finding meaning, because when we find something meaningless, we say this is absurd. And when you say absurd, you've given yourself away, because the term *ab-surdus* is the exact opposite to *ob-audiens. Ab-surdus* means absolutely deaf, and so if you say, This is absurd, you have simply said, I am absolutely deaf to what this is going to tell me. You see. The totality is speaking to me and I am absolutely deaf. And there is nothing out there that's deaf. You cannot attribute deafness to the source of sound. You see. You are deaf. You can't hear. And so the only alternative that all of us have in any form of life is to replace an absurd attitude (absurdity has many degrees) by an obedient attitude (and obedience too has many degrees) and it takes a lifetime to get just a little ways in it.

So, what all this boils down to is that there is a lot more to life than just the phenomena. There is a whole dimension to life to which we have to listen with our whole heart, mindfully, as we say. Mindfullness is necessary to find meaning, and the intellect is not the full mind; there is more to our mind than the intellect. The intellect, one has to hasten to say, is an extremely important part of our mind — but it isn't the whole mind. What I mean here when I say mind is more what the Bible calls the "heart," what many religious traditions call the "heart." The heart is the whole person, the heart, not as the seat of the emotions, not in the sense of which we say of someone who is just oozing emotion, well, he has a heart like a whale, but a brain like a mosquito, or something like that. This is not the kind of heart that we are talking about, but the heart in the sense in which a lover says I will give you my heart. That doesn't mean I give you part of myself; that doesn't mean I give you the best part of myself; it means I give my self to you. So when we speak about whole-heartedness, whole-hearted approach to life, mind-fullness, that is the attitude through which alone we give ourselves to meaning.

A technical term that is mostly used in the Catholic tradition, it's a good term for this, is recollection — to be recollected, to live recollectedly. Now this is a somewhat technical term, but it means the same thing as mindfulness, whole heartedness, openness to meaning. And recollectedness is concentration without elimination, that is T.S. Eliot's phrase. A paradox because concentration normally limits, but if you can accomplish concentration without elimination, if you can combine the attitude of focusing on something and yet be totally open without horizons, then you have accomplished what recollection means. And then you have accomplished what all of monastic life, in any of its traditions, is after — recollected living. Mindful living. Deliberate living. Monasticism in forms in which it has not been catalogued or recognized as being strictly monastic. Thoreau, when he goes to Walden Pond says, I have gone into the woods to live deliberately. That means, recollectedly in this sense. There are many forms of monasticism that are not labeled as such, and they may be much more important than the others. The decisive thing by which you will recognize monastic life is that it is a recollected life, mindful life, wholehearted living. And it is through wholehearted living that meaning flows into our lives. And that means that while we are engaged in purpose, we keep ourselves open enough to let meaning flow into our life. We don't get stuck in purpose (and we tend to get stuck in purpose).

It may help us if we see that work as work in the narrowest sense, is closely related to purpose. Work is that kind of activity that aims at a particular purpose and when that particular purpose is accomplished, the work as work ceases. Over against this is play. Play does not aim at any particular purpose. Play has meaning. Play is the blossoming forth of meaning. You work until you have accomplished your purpose. You sweep the floor in order to get it swept. But you don't sing a song in order to get it sung; you sing in order to sing. And you don't dance — as Alan Watts pointed out — to get somewhere. You dance in order to dance. It has all its meaning in itself.

Now we tend to think that the opposite of work is leisure. We say work and leisure. But leisure is not the opposite of work. Play is the opposite of work. If you have to have a polarity like that, leisure is precisely the bridging of this gap — leisure is precisely work-play, or play-work. It's precisely doing your work with the attitude of play, that means, putting into your work what is most important about our playing, namely that you do it for its own sake, not only in order to accomplish a particular purpose, and that means that you have to give it time. Leisure is not the privilege for those who can take time in order to have leisure. Leisure is a virtue. It is the virtue of those who give time to whatever takes time. And give as much time as it deserves. And so work leisurely and find meaning in their work. And so come fully alive. Because if we have a strict work mentality, we are only half alive. We are like people who only breathe in, and suffocate. You have to breathe in and breathe out in order to keep alive. It doesn't really make any difference whether you only breathe in or only breathe out, you will suffocate in either case. And that is a very good point towards the fact that we are not playing off work against play. Or purpose against meaning. We have to breathe in and breathe out and so we keep alive, and this is what all religion must be about — aliveness. This is what all great things are about — to be fully alive.

And now the great question is — why are we not more alive? And the answer is one word: fear. There's only one thing that's at the root of everything that distorts or destroys life — and that is fear. We are simply afraid to be alive. Why are we afraid to be alive? Because to be alive means giving ourselves. And when you really give yourself, you never know what's going to happen to you.

As long as you keep everything nicely under control, everything's purpose directed, everything's in hand; no danger, but no life either. Ultimate boredom. A world in which we could keep everything under control would be so boring that we'd be dead, we'd die of boredom. And we experience that. We experience it in little ways. Every day we get scared and we keep things under control, and the moment we really get them under control, they get boring. Think of interpersonal relationships: I got her number . . . I know how to handle her. I know how to handle him. This is all right to a certain point; it's very reassuring. But then comes the point where it gets totally boring.

The moment you have adventure, you have danger, you have risk. You can't have adventure without risk. And so you open yourself a little bit, and you relax your grip a little bit, and the moment you do that it gets very interesting and adventuresome, but also scary. And the next thing you know is that you're clamming up again, and you're trying to get things under control again, and so we go back and forth, and back and forth between these two poles all our life, and that's really where the spiritual life is at. That's what religion is all about. The fear of losing ourselves, and what it is that overcomes that fear. The thing that overcomes fear is courage, and courage is our contemporary expression for what traditional religion in all its different branches called faith.

Let's not use that term faith more often than absolutely necessary because it throws us off. We have wrong notions about faith. We think that faith means believing something. Yes, it also means believing

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something because if you really trust in a person, if you have really faith in a friend, that also implies that you are believing some things about that friend. But that is very secondary, and if you get stuck in that you never get at the root of faith. Faith is not a subscribing to some dogmas, or to some articles of faith or anything like that. Faith is courageous trust, ultimately, in life. Even courageous trust in someone who explicitly or implicitly said, I am life. But it can be true religious faith in life without interposing someone who said I am life. The particular form that our religious faith takes depends entirely on the time and the place and the social structure and the cultural forms into which we are born. There is an infinite variety of these, but what is the essence of our faith is the same at all times and in all places, and it is the courageous trust in life. There is no other religious faith.

Faith vs. fear is the key issue of religion. That is the key of our attitude towards truth — because we do know that religion has something to do with truth. But it isn't the truth that you can take and grab and grasp and take home with you. "We hold these truths" and the next thing is that you clash with everybody who does not hold these truths. And when it comes down to it, everybody holds a different truth. And there are as many truths as there are people around. And so if you insist on the truth being something that you must hold, then you are at odds with everybody else in the world. But if you discover that the real truth you are after is something that holds you in those moments when you really open yourself, then there is only one truth and it takes hold of everybody. And there must be an infinite variety of ways in which truth takes hold of all of us because in that variety the unity of truth blossoms forth. And it is beautiful, and we must assert it, and we must celebrate it. And that's what life is, and that's what religious life is, but that's giving yourself to the truth, and not taking the truth, grasping the truth, holding the truth. It's only the truth to which you give yourself that will make you free, the one truth for all of us. And that's the courage that we must have to give ourselves to truth. Fear hangs on. Fear always grabs for something. The moment you get fearful you grasp for something with the reflex of the monkey that grabs for the mother. We have it all deeply in ourselves — genetically — that fear that makes us hang on to something. But faith is precisely letting go.

That is universal, even in religious traditions which may not use the term faith. It has finally become clear to us that what is really essential to all the different religions is faith, is this attitude of letting go, is this courageous trust in life. And that couldn't have become clear to us much earlier than this, than 1974, because much earlier than 1974 we just did not have the material to compare, and to see what really other traditions were all about. It took a great amount of comparative religion and the gathering of data until we could really see and verify that this was so, but by now it has become obvious to a good many people, and it will increasingly become obvious to everybody on this globe, that basically there are only two ways of being religious, that the borderlines that we thought went between Christians and Buddhists, and Buddhists and Hindus, and Moslems and Jews are irrelevant, ultimately. They are interesting on a certain level, and very important on a certain level but when you come to the core of religion, they're irrelevant.

There's only one line that goes through, and that goes through in another direction — horizontally — through all the Buddhists, through all the Hindus, through all the Christians, and incidentally through each one of us, and that is the line between the right way of being religious, the only way of being religious, and the wrong way of being religious. That is the line between fear, in its religious expressions, and faith — to us, courage in life. Fear in its religious expressions takes all sorts of forms. Dogmatism is one, the most obvious one. Scientism is another one, because it's just a different form of dogmatism. Fundamentalism is one. Moralism is one, because you hang on to something that you can do — it's what Paul calls the law vs. grace, or works vs. faith. You do something; as long as you can do it you have something under control. You don't have to trust in anything, you trust in what you can accomplish and manipulate.

Basically, what it boils down to is that there are only two forms of being religious around the world any more and, if you'll excuse me, I will call them fundamentalist on the one hand, and that's the religion of fear, and obviously in the way in which I use religion, it isn't religion at all, but it's called religion, so let's call it the wrong kind of religion, the monkey religion, the aping religion, the religion of fear. And over against that is the catholic faith, but please let's write catholic with a small 'c', because the great problem with Catholics is that they aren't catholic enough. And there are catholic Buddhists who are much more catholic than the Catholics with a capital 'C' and there are catholic Jews, and there are catholic Hindus, and there are catholic Moslems, and there are catholic everybodies. There are even catholic atheists, but there are also fundamentalist atheists. And that's where the line goes through. See?

The focus is on meaning in the catholic faith, if you'll allow me to use this term. The focus is on riding the bike as our friend Paula said last night over against taking the bike apart. It is very good to take the bike apart, to see its purpose, to see its working. When you take the bike apart you have to take things in hand. And that's fine and that's good, but it has to be in the whole context. When you give yourself to meaning, you really have to give yourself, and we know how difficult it is for ourselves to give ourselves. And if you don't believe it, just watch your language and see how many, many times a day you are using idiomatic expressions in English that say "I take this," and "I take that." We have not one idiomatic expression that says, "I give myself to something." You take a course, and you take an exam, and you take a walk, and you take a pill, and you take a meal, and you take a shower, and you take a bath, and you take a seat, and you take all sorts of things that nobody can even take — a husband, a wife, a nap. If you have ever tried to take a nap it's the surest route to insomnia. But the moment you give yourself to the nap you're asleep!

This is the reason why there have to be places like Lindisfarne in which we learn to give ourselves as we take things in hand. Lindisfarne, or Houses of Prayer, and all other places of this sort have a long way to go to become truly monastic and truly catholic, and everyone of us has a long way to go.

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Question: *Do you have a definition for wisdom?*

Answer: Not right up my sleeve. But when I went over my notes this morning and I put down this pair — purpose and meaning — I was at one point thinking of jotting down, cleverness (or skill) and wisdom, because that has come up, has surfaced several times in the course of our discussions this week — that wisdom was seen over against skill and cleverness. This is, for instance, how some of the American Indians would characterize our approach to life. They would say we are very clever but we are not really wise. So, without trying to give a definition, I would certainly like to see wisdom in some essential sense connected with that openness towards meaning, or go a step further with that exposure to meaning. Exposure in a somewhat scary sense.

Now it's a very significant fact that the Bible says, on more than one occasion in fact, that the beginning of wisdom is the fear of the Lord. Well, that word "fear" of the Lord is something that we would probably have to have a separate lecture about in order to know what that one term means, but — well, I give you a Hassidic story about the fear of the Lord. One of the disciples asked one of the great Hassidic masters about the fear of the Lord and how he could be sure that he really had it in a given situation. This was in Russia, or in East Germany or Poland. The master said, Have you ever seen wolves? And of course the disciple had seen plenty of wolves, so the next question was, Did you think about your fear? And the student said, No, I was only thinking about the wolves. And that's the end of the story. So the fear of the Lord is not that you are aware of your fear, or even aware of the Lord. You're just there. There's just this confrontation. And that is where the faith comes in. So fear of the Lord is the beginning of wisdom, and then faith is the end of wisdom.

Question: *I don't understand the difference between purpose and meaning.*

Answer: The distinction is that we do have a different attitude in situations in which we say that something is purposeful or something is meaningful. Let me just maybe elaborate a little bit on what I said. One angle under which one could look at it is usefulness. When we speak about purpose, we have usefulness in mind. This is a semantic argument — we are just talking about terms. But behind the terms is a lot more, and by clarifying our terms we can clarify our thinking, and by clarifying our thinking we can clarify our living, and so it's very helpful. When you are talking about meaning, the useful is very little in evidence. In fact, some of the most meaningful things in life don't have any specific use. It would be very difficult to pinpoint the use of poetry. It's precisely so important to us because it is so superfluous. You have, in a big college, drinking fountains all over the place. They're very useful, but nobody is going to sit and take in all the deep meaning of the water there. Just go and get a drink and run. But then outside the building on the lawn is a fountain that nobody can drink from, nobody can swim in, nobody can do anything with. It is totally superfluous, and that is the place where you sit on a bench and take it all in, and let it do something to you, and just listen to the sound, and so forth.

Or, you have a key ring, and on your key ring is some trinket that is totally useless. When you lose your keys you are really in trouble, but you don't mind because you can always replace a key, but you can never replace that one particular seashell that was hanging on your key ring. That was the meaningful thing. The key was the purposeful thing. So we do make a clear distinction between the two, and it is a helpful distinction because I think a lot about our whole religious stance in life depends on finally discovering that the whole world is really superfluous. As long as we think that it is superbly important, we are taking ourselves and everything else as so terribly important. Well, it's all superfluous. It is all, in the Biblical sense, an overflowing of God's love, and joy, and peace and life. ■

James Twomey

Brother David leading Zen walking meditation at Mount Savior Monastery.

. . . AS COMMUNICATION AND AS STATE.

BY ROY A. RAPPAPORT

Illustrations by Carol Kramer

Our society is ritual-poor, possibly for the reason that Kropotkin gives for the breakdown of communal cooperation — it is replaced by the State. (More on this on p. 67.)

If Rappaport is right that ritual helps correct the fragmentation in society and the individual that goes with increasing intelligence, then we stand in an odd place.

It seems we must use our intelligence to devise rituals which alleviate the excesses of intelligence. This is a new ball game. In the past, rituals grew. Now, perhaps, they must be researched, invented, evaluated, agreed to, applied, co-evolved.

Intentional yielding is a tricky bit. We will need all of Rappaport's information-theory sophistication in the analysis of ritual's function . . . AND the contradictory (complementary) acknowledgment of central unanalyzable mystery. This is faith, or surrender, or — a term that came to me recently during volleyball — controlled abandon.

The CoEvolution Quarterly *has run two other papers by Roy Rappaport. "Energy and the Structure of Adaptation" was in the Spring '74 issue. "Sanctity and Adaptation" was in Summer '74. Rappaport himself is at the Department of Anthropology, University of Michigan, Ann Arbor.*

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I RITUAL AS COMMUNICATION

"Ritual", we are informed by Webster's unabridged dictionary, in its broadest sense refers to "any practice . . . regularly repeated in a set, precise manner so as to satisfy one's sense of fitness." Such a definition easily accommodates the obsessional behavior of neurotics, the stereotyped but adaptive interactions between a mother and her infant, the antic interplay of the wine waiter and the connoisseur, the formal aspects of daily social life and religious services; and "ritual" and the closely related term "ceremony" have been so used by psychiatrists, anthropologists and others (for instance, Freud 1907, Erikson 1966, Leach 1966, Goffman 1956, Fortes 1966 respectively). Nor has application of the term been confined to the human species. Ethologists use "ritual" and "ritualization" to designate behavior observed not only among other mammals, reptiles and fish, but even among members of other phyla. (Huxley 1966, Cullen 1966).

Do we note here nothing more than an instance of a term stretched to cover events of such diversity that little is to be gained from attending to whatever superficial similarities might prevail among them, or does the use of a single term for such widely different phenomena as the courtship dance of fiddler crabs (Crane 1966) and the high mass recognize important commonalties underlying undoubted, but perhaps not ultimate, dissimilarities? There are surely important differences between the gyrations of impassioned crustacea and the genuflections of Catholic priests, and it would be absurd to minimize them. However, at the outset it is useful to focus not on such differences, as striking as they may be, but upon their similarities, as abstract, general or even vacuous as they may seem. The similarities recognized by Webster's are apparent. But to say that they are apparent is to say that they are superficial only in the sense that they manifest themselves on surfaces, so to speak, that they are perceptible. It is not to say that they are not profound phylogenetically or ontogenetically nor that they are adaptively unimportant.

Several of ritual's formal aspects are identified by the dictionary, namely that they are composed of conventional, even stereotyped elements, for instance gestures and postures, that the arrangement of these elements with respect to each other in time and space is more or less fixed, and that they are performed regularly at times fixed by the clock, calendar or specified circumstance. It is further implied that some components of rituals, if not entire rituals, are non-instrumental in the sense that they do not contribute directly to the biological or economic well-being of the performer: they satisfy propriety rather than utility. Some scholars (e.g. Leach 1954) have taken this aspect of ritual to be of especial importance and have used "ritual" to refer to, among other things, non-utilitarian frills embellishing otherwise materially instrumental behavior.

Not clearly indicated, perhaps not indicated at all by the dictionary is a relationship between ritual and the regulation of emotion. The regulation of emotion, or at least a relationship between ritual and emotion, has been taken by some students of animals and men to be general. The phrase "regulation of emotion" indicates a class of functions or meta-functions, and many others have also been proposed for ritual by both ethologists and social scientists, although usually without claims of universality. Be this as it may, it is useful to note here that there are striking resemblences between the forms of animal and human rituals, but that their resemblences may go beyond those of form. For instance, from what I gather, the massed dancing of European ruffs (Braestrup 1966) on their leks in the presence of the hens of their species resembles in obvious ways a kaiko, or festival, among the Maring and other peoples of the New Guinea highlands (Rappaport 1968). In the latter men decked out in bird of paradise plumes disport themselves similarly before the females of their species. But more than that: some of the messages transmitted by some of the participants to others are quite similar in the case of the birds and of the highlanders. In both, males signal by their continued dancing an interest in females, and in both some antagonism between males is also signalled. Visitors to a Maring kaiko also signal through dancing their pledge to their hosts to help them in future military endeavours and Wynne-Edwards argues that in some animal rituals the entire assemblage signals to those composing it information concerning its strength and density (1962).

INDEXICAL MESSAGES

We have come, almost surreptitiously, to a conception of ritual as communication. Ethologists have generally so interpreted it, and in light of such an interpretation even the very quality of the grotesque characteristic of some stereotyped ritual posturing becomes understandable. For a signal to be effective it should be easy to distinguish from ordinary instrumental activity. The more bizarre the ritual movement the more easily may it be recognized as a signal.

It is hardly news to any anthropologist that ritual communicates. Indeed, a good number of anthropologists would include communication within any definition of ritual they might propose. If the notion of auto-communication (Wallace 1966) is acceptable (and I can see no reason why it should not be, given the looseness of integration of the human psyche, and the extent to which some mental processes are hidden from others) then even the obsessional rituals of neurotics and the private devotions of the pious can be regarded as communication events. But the transmission of the sort of information being discussed here — simple, straightforward information concerning the current state of the sender, is probably not what most anthropologists have in mind when they think of ritual communication. I shall return to what I take to be their usual concerns shortly, but I would first note that Lyons (1972:71) refers to information about the current social, psychic or physical state of the organism transmitting it as indexical. In accord with Lyons I believe that all animal ritual communication is indexical, and all human ritual has an indexical component. This is not to say that other sorts of information may not be transmitted, at least in human ritual. It is to say that it is in their indexical aspects that human and animal ritual resemble each other most closely.

CEREMONIAL MESSAGES

Having emphasized some of the similarities that unite all that is called ritual into a single great class we may now call attention to some of the differences distinguishing animal rituals from most human rituals and, among humans, those which are religious from those which are not. We have already implied what these distinctions may be, but it is well to make them explicit.

As we have noted, in the rituals of animals the information content of the ritual is likely to be exhausted by the messages concerning their current states transmitted among the participants. For example, when a baboon presents his rump to one of his fellows he is transmitting a statement of subordination to the other. When the other mounts he signals dominance. There are no messages being transmitted other than those concerning the way in which each of the participants stands, for the moment, in his relationship to the other. Thus, the information content of the ritual and the information content of the indexical messages transmitted in the ritual are coextensive. To put this a little differently, the ritual is entirely indexical. The same may be said about such human rituals as tipping the hat or saluting.

But some human rituals are different, for in them the information content of the messages originating among and transmitted among the participants concerning their contemporary states is not coextensive with the information content of the ritual. There is additional information carried by the liturgy. It is here that we find symbolically encoded information concerning the social order. It is this information — let us call it ceremonial — with which anthropologists are probably most concerned when they think of ritual communication.

It may be objected that the distinction between indexical and the ceremonial information is overdrawn, since information concerning social orders can be abstracted from, or deutero-learned (G. Bateson 1951) from, the regularities of social relations. From observing a great many cases of men tipping their hats to women a child or an anthropologist may learn something of the social order prevailing, and it may be that infra-human primates also make similar abstractions from social relations. But there is an important difference, I think, between ceremonial messages and abstraction from indexical messages.

In the latter case each organism must make his own interpretations of social relations if he is to derive a conception of the social order. Since different organisms may interpret the same events differently different understandings of the social order may well be constructed by them. It is plausible to assume that the likelihood of disparities between the views of their organization entertained by the members of a group will increase with increases in intelligence, for increased intelligence surely would provide the ability to increase the range of possible interpretations. This is to say that increased intelligence of itself proposes a problem to social life, for with increased intelligence differences between the understandings of the organization in terms of which social relations proceed may grow wider. But ceremonial messages themselves express a social order. Their expression both alleviates the interpretive burdens placed upon individuals and reduces disparities among the understandings of their organization held by the different members of a group. Interpretation surely remains, but the range of possible interpretations is narrower than what would be available to the unbridled intelligences of individuals. Ceremonial, in a sense, replaces genetics in specifying social orders among humans. We shall return to this point. Here let us observe that we would expect ceremonial to have increased with increases in intelligence not only because increased intelligence made it possible but also because increased intelligence possibly made it necessary. It may be added that where the possible and necessary are thus related an evolutionary positive feedback relationship is likely.

Ceremonial information, like indexical information, is transmitted by some or all participants to themselves or to other participants. But while participants are the transmitters of ceremonial information they are not, generally, its source. It is not encoded by them, but found out by them already encoded in the liturgy. Its source is conceived by the participants to be distinct from themselves and possibly remote from them in time and space. They merely give it voice or enliven it through ritual action.

CERTAINTY AND INVARIANCY

The performance of the Ceremonial component may vary somewhat from occasion to occasion, and may well change considerably through time in response to changes in the structures that it somehow symbolizes or represents. But it may well be seen by the participants to be invariant, and compared to the indexical aspects of the ritual (in which communication relies upon whatever possibilities for variation a stereotyped framework provides) it does change relatively little.

In this regard it is important to recall Wallace's insight (1966) that in light of formal information theory ritual is a very peculiar form of communication. Information, in the information theoretical, sense is quantitative. It can be measured in bits, a bit being that which eliminates the uncertainty between two equally likely alternatives, the amount of information in the answer to a yes-no question when "yes" and "no" are equally likely. But to the extent that a ritual unfolds in an invariant way, to the extent that knowledgeable participants know what is coming next, no information in the technical sense is transmitted by the ritual because its progress eliminates no uncertainty. Therefore, Wallace proposes, ritual, by which he means liturgy, is communication devoid of information. But to say that it is devoid of information is not to say that it is devoid of meaning, if meaning is taken to be the effect of a message upon the recipient's understanding of the world and his relation to it. The meaning of the invariant liturgy which has no alternative and whose unfolding therefore reduces no uncertainty is certainty. The ceremonial information encoded in the liturgy expresses an enduring order, a set of certainties, within the limits of which the varying uncertain fluctuations of indexical information can be interpreted.

SACRED MESSAGES

In some rituals yet a third informational component may be distinguished from the ceremonial even though both are encoded in the liturgy. This is the component with which the devout are most concerned. Let us call it the sacred. It is likely to be concerned with the ostensible general purpose of the ritual — to honor dead ancestors or to worship Christ, and with the metaphysical assumptions upon which such ritual actions stand: that dead ancestors persist as sentient beings, that Christ is divine. The encoding of such statements, (implicitly or explicitly) in the liturgy is, of course, what makes a ritual religious.

It is of great significance that sacred information is usually even more invariant that ceremonial information. For instance, although other aspects of their liturgies vary considerably, possibly in reflection of differences in their social conditions and views of the universe, the rituals of Ashkenazic, Sephardic, Karaite, Falasha and Beni jews all retain the schema in a central position. The invariance of the sacred component implies a certainty beyond the certainties of the social orders currently existing. As ceremonial messages symbolize a more or less enduring order — within which the states reflected by indexical messages may fluctuate, so sacred information provides an apparently eternal meta-order, an order of orders, in terms of which social orders themselves may be transformed. In this regard it is important to note that the statements that are the essence of sacred information — elsewhere (1971a 1971b) I have called them ultimate sacred propositions — statements like the shema of the jews: "Hear Oh Israel, the Lord our God the Lord is One", are themselves without specific social or, for that matter, physical import. Since they are without specific social import their connection to particular social orders is a matter of interpretation. Since this is the case even highly sanctified social orders may be changed through reinterpretation without any challenge to the ultimate certainty encoded in liturgy.

PARTICIPATION, ACQUIESCENCE AND REDUCTION OF GENETIC SPECIFICITY

We have, in sum, distinguished three sorts of information that are transmitted in ritual, the indexical, the ceremonial and the sacred. I have argued that all ritual has an indexical component while some human rituals have ceremonial components. The sacred defines religious rituals, a yet more restricted class. We have argued that the progression from indexical to sacred is one of increasing invariance in the messages transmitted and that this increasing invariance itself signals an increasing certainty concerning the substance of these messages. I also argued that this increasing certainty is associated with decreasing social specificity, and this allows continuity to be maintained through orderly change. This is to say that the relationship between certainty and specificity noted in ritual is an aspect of adaptive structure. (Rappaport, 1971b)

Webster: "any practice... regularly repeated in a set precise manner so as to satisfy one's sense of fitness."

Chorus: ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual, ritual...

Rappaport: reconciliation in change.

Two further points are to be made.

First, it may seem that in many rituals the importance of the ceremonial and sacred information outweighs that of the indexical, indeed that the indexical information transmitted is trivial. It may be suggested, however, that although the indexical information, or some of it, that is transmitted in rituals may be obvious it is not at all trivial. Whatever else he may be signalling about himself the minimum indexical information transmitted by any participant in any ritual that also includes ceremonial and sacred information is that he acquiesces to the social or cosmological orders symbolized in the liturgy. Since this message is transmitted by his mere presence or participation it is obvious, as signals generally should be. But this information is not trivial to himself or to his fellows, for he could conceivably do otherwise.

It will become apparent that the second point is related to the first. The certainties of ceremonial and sacred messages seem to be found only among humans. This is largely surprising since their transmission is likely to depend — perhaps does so by definition — on the use of symbols. If this is the case and other animals are without symbols, or virtually so, then their failure to communicate ceremonial or sacred information in their rituals requires no further explanation. But, conversely, the ability to use symbols is not sufficient to explain why humans do transmit ceremonial and sacred information in some of their rituals. It is, I think, relevant here that there seems to have been associated with the emergence of language, at least in time, a general decrease in the degree to which behavior and patterns for behavior are genetically specified. The replacement of genetic by cultural "programming" has permitted men to enter, and eventually to dominate, the great range of environments the world presents to them. But intrinsic to this increased flexibility, a flexibility so great that it permits any infant to come to adopt the conventions of any society, is the concommitant problem that men are no longer genetically constrained to abide by the conventions of the societies in which they do happen to live. In the absence of the certainties of genetically specified behavior sacred and ceremonial messages certify the conventions of particular societies and even sanctify changes in them. The presentation to men of the certainties of ceremonial and sacred information not only gives support to the conventions they encode but establishes for men particular meanings from among the great range of meanings available to their genetically unbounded imaginations. As such social and ceremonial messages protect society from what Bergson (1935) called "the dissolving power of human intelligence."

RITUALIZATION OF THE INDIVIDUAL

Our discussion implies that the ceremonial and sacred information transmitted in ritual may be especially compelling. Suggestions advanced by Erikson (1966), Campbell (1959) and Wallace (1966) concerning the effects of such information on those receiving it are of importance here. These writers have proposed, as have others, that the sacred and ceremonial messages received in ritual may become almost as deeply and firmly established within the organization of the recipient as they would be if they were inscribed on his chromosomes.

Erikson, defining "ritualization" as "agreed upon interplay between at least two persons who repeat it at meaningful intervals and in recurring contexts; . . . [which has] adaptive value for both participants (337)" speaks of "rituals of ontogeny." He proposes that ontogeny is a process in which generalized human infants are transformed, through ritualization, into Frenchmen or Aranda or Maring. This process is grounded in the interactions of the pre-verbal infant with its mother. Its mother possesses for the infant, Erikson claims, those characteristics which Rudolph Otto (1923) called "numinous" and which he ascribes to the worshipper's experience of the divine. To use Otto's terminology of the numinous, she is certainly mysterium — incomprehensible — to the child because the child does not yet have comprehension. She is tremendum — all powerful and occasionally wrathful, she is urgent, that is experienced as immediate and alive, and she is fascinans — loving and nurturing. In stereotyped interactions with her at regular times in repeated contexts the child learns to trust her upon whom he depends utterly because the meta-message of stereotypy, regularity and repetition is, in its very form, dependability. Thus, the early experience of mother as numinous not only lays the ground for explicitly religious experiences in the future, but also opens the infant to further ritualization, first from parents and then from others as he proceeds through childhood and adolescence. The ritualization of ontogeny reaches its full elaboration and perhaps culmination, although perhaps not its conclusion, in the grand public ceremonies which sanctify those who will ritualize the next generation. Ritualization is, of course, a culturally specific process and the end products of such ritualization may conceive themselves to be as different from those who have undergone different ritualization as distinct species are from each other. Indeed, Erikson has used the term "pseudo-species" to refer to the products of ritualized differentiation, and his argument suggests that ethnocentrism and racism are likely, although certainly not inevitable, concommitants of ritualization.

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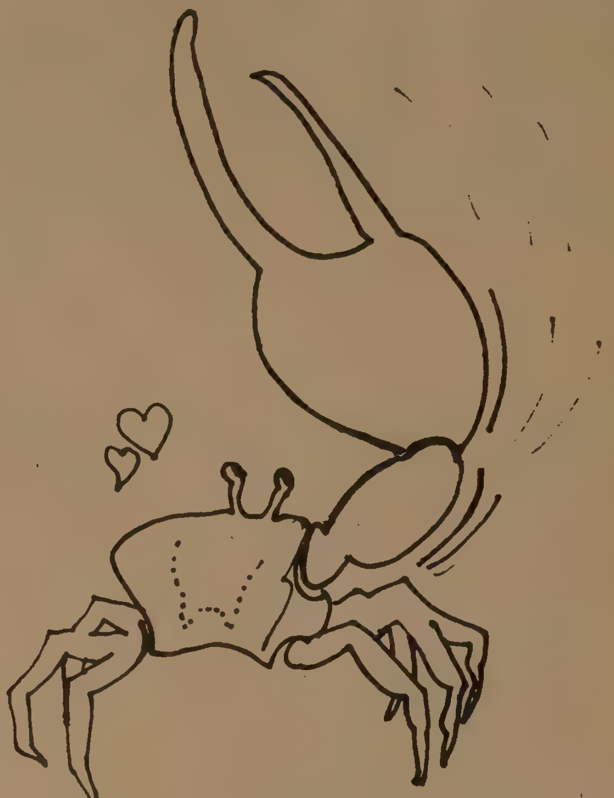
Wallace is concerned more specifically with formal public ritual, particularly religious ritual, and with the actual mechanisms through which the individual incorporates sacred and ceremonial information. He suggests that ritual learning is different from ordinary learning. Whereas ordinary learning is based upon practice and reinforcement, ritual learning relies upon what he calls the "law of dissociation", which holds that cognitive and affective restructuring is facilitated by excluding from the conscious awareness of the learner perceptual cues associated with the learning of ordinary material and presenting to him only cues relating to the material to be learned. He is started off afresh, so to speak. A number of techniques may be used to dissociate the learner — sensory overload or deprivation, the ingestion of drugs, monotonous chanting or drumming, the infliction of pain, isolation, unfamiliar surrounding, unfamiliar behavior and so on. The learner, in short, is put into an absorbing and stressful situation in which all or most of what he has previously learned is irrelevant and therefore out of mind for the moment. His canons of reality and judgment are disrupted and in this state he is very open to restructuring old material or learning new. What he learns in such situations he is likely to learn well, for in a sense, he is being reduced to something like infancy and what is learned in infancy is likely to be very firmly established. In this reduction to pseudo-infancy it may also be that he recaptures the sense of the numinous that Erikson suggests was first experienced with respect to his mother when he actually was an infant. He may, therefore, invest with numinous emotion whatever information is presented him, or whoever it is who presents it to him.

That the learner is returned to infancy is supported by the widespread occurrence of birth and death symbolism in rites of passage, the rituals to which Wallace's suggestions are most applicable. But that the learner is reduced to a kind of infancy in ritual does not mean that ritual is infantilizing. Campbell has argued, as have others, that if a rite of passage or a sequence of such rites is successful the result is the opposite: it advances the novice a stage or a number of stages on his road to maturity. The infancy to which he returns is a new infancy in which he is separated from old dependencies. This process is facilitated, Campbell claims, by the bipolarity of the symbols figuring in rites of passage. This aspect of symbols has been brilliantly explored more recently by Turner in a number of works (1969, 1966, 1969a, 1969b, 1973). They refer on the one hand to general human physical and psychic processes and, on the other, to the social and sacred order prevailing. While the personal referents give immediacy and emotional force to the cosmological referents the latter sublimate, which is to say make sublime, the physical and psychic processes to which they are symbolically bound. Thus, a primal dependence upon the mother is replaced, through the rituals of ontogeny, by a relation, in some respect similar, to the group or to supernatural entities associated with the group, and emotions which if left undirected would remain infantile and disruptive are brought into the service of order and maturity.

The material learned in ritual is not usually of direct instrumental advantage to the learner. Instrumental materials or skills are probably better learned through ordinary practice and reinforcement. What is learned is more likely to concern matters transcending the learner's personal interest and to include, most importantly if not exclusively, propositions concerning the sacred and social order prevailing in the society, that is, sacred and ceremonial information carried by liturgy. We shall approach certain related matters later. Here let us summarize by noting that ritual communication involves more than special modes of transmission and particular sorts of information. It also involves and depends upon a special sort of reception by specially prepared receivers. The reception of messages in some rituals, particularly rites of passage, transforms the receiver in profound ways. Ritual communication in a very deep sense informs, that is gives form to, or orders, the life patterns of those receiving it. Their lives are ritualized, so to speak, and their ability to receive information in subsequent rituals is contingent upon their earlier ritualization.



DISPLAY

We have spoken of the sorts of information that may be communicated in rituals, and of its reception, but only in passing about how it is communicated. To say, for instance, that indexical information is transmitted in ritual is not to say that it is transmitted only in ritual. Similarly, sacred information may be transmitted in myths for which there are no corresponding rituals and much information concerning the current social order is certainly transmitted outside of ritual.

The term "ritual" implies a mode of transmission as much as anything else, and our discussion so far, as well as those of many others, suggests that this mode is that of conventional display. Display is both a complex and a vague category, but it would seem to include the assumption of stylized postures, the use of stereotyped gestures, presence at special places on special times, dressing in special costume, the manipulation of special paraphernalia, and so on. This is to say that display certainly implies more than thought and probably more than vocalization, although extraordinary vocalization figures in many displays. It implies some perceptible alteration of the general state of the participant. Courting peacocks and praying Jews move in stereotyped ways, mourning Maring and angry sticklebacks assume special colors, and as the faithful of a certain persuasion assemble at a particular church on Sunday morning, so do the starlings assemble on a certain tree at dusk.

But it may be objected that whereas we may accept the notion of auto-communication it is stretching the common sense meaning of "display" too far to argue that it forms a component of solitary ritual. We are not engaged here in a definitional exercise and would be content to leave the border between ritual and non-ritual in some degree unclear, readily admitting to the category "ritual" some events in which display probably doesn't figure. We may think here of a soldier silently praying as he awaits, in a posture of readiness rather than worship, for the command to attack. Yet, if we were sufficiently observant we might well glimpse, even under such extreme conditions some little ritual gesture — for instance, a Catholic soldier might cross himself. It is a remarkable fact that even rituals that are generally conducted in solitude often require the assumption of special postures or the performance of stereotyped movements or the manipulation of special paraphernalia and, like public rituals, they are often performed in special places at special times. The child does not recite his daily prayer at any time or place in any way that he chooses. He kneels, eyes closed and hands clasped, by his bed at the very end of his day, and orthodox Jews may bind tefillin to their arms and foreheads before morning prayer. It does not seem improper to use the term "auto-display" to refer to what is a widespread if not almost universal aspect of solitary ritual, and it is plausible to take auto-display to be a component, and doubtless an important one, of auto-communication.

PHYSICAL DISPLAY

That the assumption of special postures or the performance of stereotyped movements, even in solitary rituals is so widespread as to approach the universal suggests to us that this aspect of ritual must be archaic. It may indeed be, as Turner (1969a) has suggested, that although almost certainly no humans are "genetically programmed" to perform any particular rituals (with the possible exception of some stereotyped mother-infant interaction) a "general propensity", lacking in specificity, for ritual performance, including display, is part of the genetic constitution of men. That it is in the formal aspects as well as in the indexical use of display that human ritual bears closest resemblance to animal ritual further supports the belief that display is archaic even if not genetically based. More important, there is a strong suggestion here that it is with indexical information that bodily display is most closely or fundamentally associated, and it is with the indexical use of display that we shall be concerned for the time being.

We may first ask about the survival among hominids of this peculiar mode of non-verbal communication many thousands or even hundreds of thousands of years into the time of language. Or, if it is objected that display among humans is not to be construed, a priori to be the reflection of a continuity with the pre-linguistic past of the species why it is that men who can transmit information with ease, efficiency and subtlety through language should also employ such an awkward, limited and expensive mode of communication. It should be kept in mind, after all, that while ritual display is not verbal not all of the indexical messages transmitted in it would resist what would seem to be adequate translation into words. In many parts of the world, for instance, postures of subordination — kneeling, prostration and the like — are assumed by the lowly before those of high rank. It would seem that the messages transmitted by such displays could be adequately rendered verbally as "I submit to you", or something of the sort. But since such messages are often transmitted by display rather than speech it is plausible to assume that the physical display says more, or says other than what the corresponding words would seem to say. Or perhaps says it better. We may ask how could information concerning some state of the transmitter better be signalled than by displaying that state itself?

It may be objected that in human display no less than in verbal communication the relationship of the signal to the referent is symbolic. That is, it is not intrinsic to the referent but only conventionally related to it. Conventional display among humans, it could well be argued, displays the state that it supposedly indicates no more or no better than would words. This is an important matter to which we shall return later. Here I would call attention to Tillich's statement that religious symbols and some others as well "participate in that to which they point (1957:42)" and to an observation made long ago by G. Bateson (1955) that "in the dim area where art, magic and religion overlap" we can sometimes "recognize an attempt to deny the difference between map and territory, and to get back to the absolute innocence of communication by pure mood-signs (1972:183)." I could tentatively suggest that human display is an attempt, as it were, to obliterate the distinction between signal and referent (map and territory) that is the sine qua non and strength of symbolic communication but may nevertheless sometimes be an embarrassment to trust and understanding. In some cases this attempt meets with a degree of success. Since social relations themselves are conventional and saturated with symbolism there may be, at least as far as information concerning current social status is concerned, little difference between a display signal and the current state of the transmitter that the display signals. For instance, to signal subordination by kneeling is not merely to indicate subordination. It is in fact to subordinate oneself for the time being to a degree comparable to that of the dog who presents his throat to another. We may note here that the nineteenth century philosopher Charles Pierce used the term "index" to refer to signals that are intrinsic to their referents (e.g., a dark cloud is an index of rain), whereas symbols are only conventionally related to their referents (e.g., as the word rain is related to actual precipitation.

It is interesting to observe that to make himself more than ordinarily credible or convincing articulate man may leave the subtlties of language behind and express himself in actions that appear to be as straightforward as those of speechless beasts. To voice subordination is simply to declare it, but to kneel subordination is to indicate or demonstrate it. (We may be reminded here that the term "demonstration" is used to refer to secular rituals in which information concerning political attitudes is transmitted by display). "Actions," as the saying goes, "speak louder than words," even when the actions are ritual actions — or perhaps especially when they are ritual actions for, as we have argued, individual humans and much of human social life are highly ritualized.

It may be that actions not only speak louder than words, but more clearly as well. The very limitations of display may enhance its ability to carry some messages with clarity. The subtlety of ordinary language is such that it can indicate, suggest, connote, hint at, or imply such delicately graded degrees of, say, subordination, respect, contempt or whatever that it can shroud all social relations in ambiguity, vagueness and uncertainty. But one kneels or one does not. By kneeling one states unambiguously that he is subordinate (although the significance of not kneeling may, in some contexts, remain ambiguous). This is not to say that clarity is in all events to be preferred to ambiguity. Ambiguity of course has its social uses. It is simply to assume that clear distinctions are in some instances of advantage in social relations and that display, because of its very limitations, may communicate more clearly than ordinary language.

Since the assumption of special postures or the performance of special gestures is an aspect of solitary as well as public rituals the suggestion that ritual actions speak more clearly and convincingly than ordinary language should be relevant to auto-communication as well as to communication between organisms. Our suggestions must be even more tentative than those concerning the virtues of display in general. It may be observed, first, that his display is directly sensible to the performer as part of himself and he may not "feel right" if it does not conform to his conception of what it should properly be. He might feel, for instance, that if he isn't kneeling he isn't really praying. Now whether or not it is erroneous for them to do so it may be that self-conscious humans, in distinguishing their conscious mental processes from their other physical processes, are led to conceive of their discursive thought, or its products (especially what they say) as separate from themselves. But to assume a special posture, or to take oneself to a special place for the performance of a ritual may be to "participate in that to which one points", and thus to communicate to oneself a unification of one's self with one's thought or words. To put this a little differently, the use of the body to transmit a message constitutes a non-discursive meta-message about the discursive message being transmitted. It communicates both to the self and to others not only what could be conveyed by a more or less corresponding set of words (like "I submit to you") but also a commitment of the living self to that message. In display one is not "just talking." He is "standing up to be counted" by others, and he is "putting himself on the line."

We may also note here that the arguments of some students of religion and related matters imply that the use of the body in ritual may be emotionally more powerful that the use of mere words. We may recall here Campbell and Turner's suggestion concerning the bipolar referents of ritual symbols, one pole, affectively powerful, refering to psychic and physical processes. We may make the further suggestion here that if the embodiment of the bipolar symbol is not simply an image but itself involves the living self, that is, if that which symbolizes the person or his condition is his own body, perhaps drawn into a ritual posture, more emotion is likely to be invoked in him than if the symbol were separate or separable from himself. Moreover, if the posture into which his body is drawn symbolizes a social condition as well as (through the mere fact of participation) the indexical information that the performer acquiesces to this condition, the social, the psychic and the symbolic become fused. The ritual use of the body, it may be suggested, makes possible a kind of unification of first, the self, then of self and message, and ultimately of self and society, that is beyond the reach of ordinary language alone.

VERBAL DISPLAY

But having noted the special virtues of ritual postures and gestures we should not overdraw the distinction between them and words. We have been contrasting display with ordinary language but not all language is ordinary. Words themselves may become ritualized and ritualized words may also be clear and convincing. But it is of great interest to note that ritualized utterances divest themselves of one of ordinary language's special talents: its ability to split and split again the world into ever finer categories and conditions and conditionals. In contrast to ordinary discourse, in which considerable choice is open to the speaker at a number of points in a meaningful utterance, ritual formulae are stereotyped, stylized, often archaic sequences of words to be ennunciated under particular, usually well known circumstances, and great stress is often laid upon their being repeated precisely. This is to say that they not only do not take advantage of language's ability to express gradation, qualification and the uniqueness of the here and now. They deliberately foreswear it. Ritual utterances are, in M. C. Bateson's terms (1973), "fused." A man pledges fealty to another or not, he publicly swears an oath or he does not. The distinction between recitation and non-recitation is unambiguous and so are differences in at least some of the formal aspects of the relationships contingent upon these alternatives.

As far as form is concerned, ritual formulae are to ordinary language as special postures or gestures are to ordinary instrumental activity, and we would agree with Leach (1966) that ritual cannot be distinguished from myth on the grounds that myth is in words while ritual is "in action." Words themselves, when they are no longer "just talk" or "mere words", but ritualized formulae as stylized as curtsies, may themselves be constituents of display and thus their recitation may, in some instances, transmit information concerning the self as unambiguously as do ritual postures. However, the non-discursive and living affirmation that physical display accords to the information it itself transmits is probably not within the capacities of verbal formulae. They don't affirm themselves in the same way that some messages transmitted by display do, but in a different way. We shall return to this matter shortly.)

Yet while the use of the body in ritual may have special powers for evoking emotions, so may words have others. It was suggested that physical display may stimulate emotion through a kind of total participation in a symbolic form, possibly a stylized posture. There is a unification of the non-discursive and discursive aspects of the self, and then through the bipolar reference of a single symbol the unification of an integrated self with the social or cosmological order. The evocative power of the verbal aspect of display in contrast, may lie in its ability to assimilate the present to a category of events established in the past. Stereotyped sequences of words are, virtually by definition, sequences of words that have been uttered before. Therefore their enunciation tends to place the current event unambiguously in a class or category that includes certain past events. As such, their use helps to impose an enduring order upon an uncertain world. Such ordering is, of course, of cognitive importance, but it may also have an affective function. As has often been noted, disorder and uncertainty are likely to provoke anxiety, and that which increases apparant order is likely to decrease anxiety. But the emotional effects of ritual recitation are surely not limited to anxiety reduction. Since the formulae have been uttered before it is likely that their utterance will bring to the minds of their auditors other times and other places at which the same words were spoken. Ritual recitations lead those who hear them back through their own memories, and personal associations with the formulae are likely to reverberate beyond conscious memory into the subconscious and unconscious.

It might be asserted that as ritualized formulae are, virtually by definition, sequences of words that have been uttered before, so ritual postures are, similarly, postures that have been assumed before. It might further be argued that as there is verbal memory so is there kinesic memory and that kinesic memory may be as evocative as verbal. We would suggest that at the least the verbal adds a dimension to personal memory. More important, it permits consciousness of the past to escape from the limits of personal memory. Ritual formulae may lead those who pronounce or hear them back through the memory of their group to similar events in the times of ancestors, or even past the ancestors to mythic events standing at the beginning of time, through, that is, the times of history to some timeless cosmic order. The notions of history and cosmos are no doubt themselves emotionally powerful, but additional power may be brought to them from their associations, through the enunciation of ritual formulae, with personal memory and its emotional consequences. Such connection to the past is surely beyond the ability of physical display, and as far as evoking emotion is concerned the verbal and bodily aspects of display do more than augment each other. They are complimentary and it is surely significant that most human rituals of any length include both stereotyped words and stereotyped uses of the body.

It may be, then that words are not altogether ineffective for the communication of information concerning the present state of the self, but it is in other aspects of ritual communication that words are indispensable. It has surely been noticed that we wandered some distance away from the indexical, at least by implication, in considering the special ability of words to connect the individual to history and to cosmos, to that which transcends the here and now, to which indexical transmissions are confined. While association with or participation in history and cosmos is signalled indexically, historical and cosmic messages themselves are not indexical. They are the subject matter of the ceremonial and sacred components of liturgy. Now the possibilities for formulating ceremonial messages except in language or codes that are based upon language are at best very limited, while possibilities for formulating sacred messages without language are non-existant. The referents of sacred messages — gods, dead ancestors and the like — are not in the here and now. Gods do not have material referents and thus cannot be referred to ostensively or by index, but only by words or codes based upon words. The complimentary relationship between the ritual use of the body and the ritual use of words is not confined to possible differences in their abilities to evoke possibly different emotions. More important is that they may be related to each other, roughly, as indexical messages are to ceremonial and sacred messages. The use of special postures and gestures are especially appropriate to indexical transmission. Among the most general and most important of indexical messages are those signalling acquiescence to the orders expressed in ceremonial and sacred messages. The latter, however, must be formulated, or at least formulable, in language or codes based upon language.

THE SACRED AND THE NUMINOUS

But the words once formulated establish order, even providing a foundation upon which indexical displays must stand. We earlier observed that ultimate sacred propositions, because they include no material terms, are beyond verification or falsification. Elsewhere (1971a) I have argued that they are nevertheless regarded by the faithful to be unquestionable, and have identified sanctity as the quality of unquestionable truthfulness imputed by the faithful to propositions which are, in their nature neither verifiable or falsifiable. The immediate social importance of sacred transmissions is to sanctify, that is to say to legitimize the orders symbolized in the ceremonial aspects of the rituals in which they are also expressed, and to certify some of the indexical messages transmitted in such rituals. The latter point is worth a brief discussion.

We earlier argued that indexical physical display in and of itself is more convincing than verbal transmission of similar information. Physical display itself seems not merely to allude to, but to display, the state to which it refers, and thus it may overcome the problem set by the peculiarity of symbolic communication, namely that the connections between signals and referents in symbolic communication are conventional. Upon this characteristic rests virtually all of language's exceptional powers, but it is this aspect of language that makes lying possible. Our earlier discussion suggested that in some instances physical display alone may be sufficient to overcome this problem intrinsic to the very virtues of symbolic communication. We may now suggest that these are instances in which the current state of the transmitter being signalled is temporally simple, for instance, the transmission of a signal of submission for the time being. But display alone may not be sufficient when the current state being signalled is temporarily complex. For instance, it will be recalled that visitors at Maring *kaiko* pledge to their hosts through dancing their help in *future* military endeavors. Whereas the display signals the pledge the pledge itself is disconnected in time from its fulfillment. How, then, can the hosts rely upon such commitments? Elsewhere (1971a, 1971b) I have argued they are taken to be sufficiently reliable to act upon because of their association in ritual with ultimate sacred propositions which are taken to be unquestionable. That is, the indexical signal seems to partake of the truthfulness inherent in the sacred message with which it is associated. This function of sanctity is explicit in the swearing of oaths. It must be emphasized that no claim is made that sanctification ensures truthfulness; we know that people do lie under oath, although most people are more willing to accept sanctified than unsanctified messages as true. The acceptance of messages as true, whether they are always so or not, contributes to social orderliness and may in fact make it possible. And in some cases at least the acceptance of messages as true may bring about the state of affairs being accepted, for, as G. Bateson (1951) pointed out years ago, the validity of many of the sentences upon which social orderliness depends is a function of belief in them. (This may be more important with respect to ceremonial than indexical information).

As the truthfulness and reliability of indexical messages are certified by their connection to ultimate sacred propositions, so the latter receive support from the participants. This support is expressed by, at least, the indexical message of participation itself. As we observed earlier, to participate in a ritual is to acquiesce to the social and sacred orders symbolized within it.

The signal of "acquiescence" may indicate the imposition of a social condition upon an ambivalent or even protesting psyche, or simply a neutral approval. But, as our discussion of ritual learning and ritualization suggested, something much more profound is often involved. In the course of some religious rituals some participants, or perhaps all of them, are likely to be affected. They experience the numinous. The particulars of numinous experiences and their intensity surely vary from religion to religion, person to person, and time to time. But what they seem to have in common is that they are not discursive. They are emotional. Since they are not in discourse they cannot be discredited by conscious reason. Indeed, such an experience seems to be self-validating. It happens, it is felt and it carries with it as Otto (1826), James (1903), and others have attested, a subjective validity which can be extremely persuasive. Since the experience of the numinous is taken by the faithful to be a response to the sacred proposition or a symbol thereof, the latter partakes of the profound sense of validity intrinsic to the former. Thus, in ritual the most abstract or ethereal of human conceptions is imbued with the absolute immediacy of human emotion. The subjective, affective validity of the numinous experience is transformed into what is taken to be the objective discursive truth of the sacred proposition. This transduction of validation from the non-rational into the rational may pose a problem for philosophers but it does not for the faithful.

We speak here of the two aspects of the holy: the sacred, which faces the discursive and the rational, and the numinous, which faces, or arises out of, non-discursive emotional processes. It is of interest that ultimate sacred propositions and numinous emotions are, in a sense, the inverse of each other. Ultimate sacred propositions are discursive but not material. Numinous experiences are material (they are actual psychic and physical states) but not discursive. While ultimate sacred propositions are unfalsifiable numinous experiences are self-validating. This remarkable relationship, in which the unfalsifiable supported by the self-validating yields the unquestionable, which in turn certifies the arbitrary, the conventional, the dubious and the indescribable, links, in ritual, the biological and cultural orders in which men are grounded.

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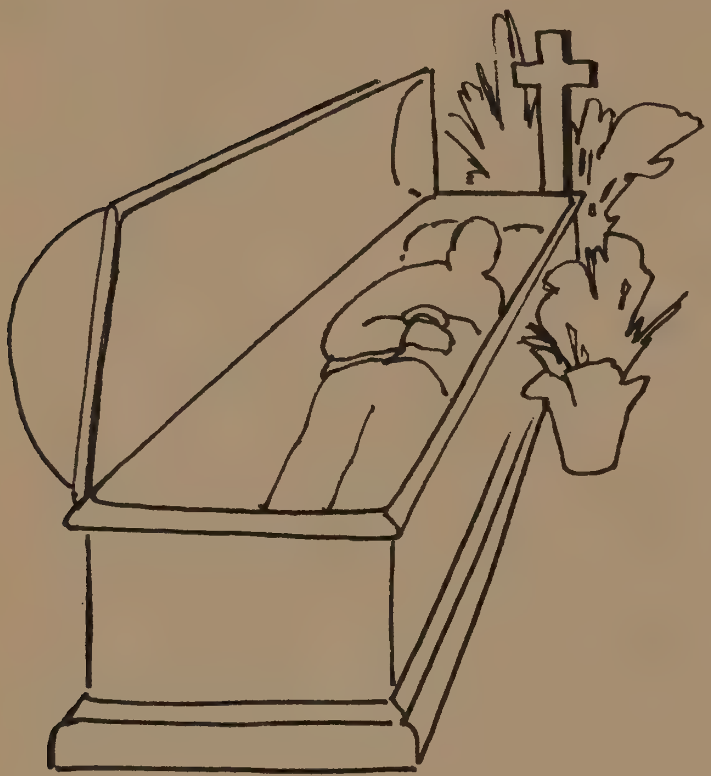
It is the base upon which ritual communication and perhaps symbolic communication in general rests. This is to say that it is one of the foundations upon which the human mode of existance stands. That the structure of mutual validation or support proposed here approaches the circular need not trouble us because it does not trouble the faithful. Indeed, its very circularity suggests cybernetic properties.

We have implied that the sacred, although it is rooted in ritual, and stands upon the emotion generated in ritual, is not confined to ritual. Sacred propositions may sanctify sentences having directly to do with the regulation of society, sentences concerning ethics, authorities, categories of thought, socialization, and even economic and ecological relations. To put it differently, ultimate sacred proposition, which may rest upon what we may, following Turner (1969) call "communitas", the numinous state of society generated in rituals, sanctifies what Turner calls "structure", the differentiated rational state of society prevailing in the conduct of its day to day affairs.



It may be suggested that if structure becomes oppressive or maladaptive it will sooner or later become desanctified. Since the numinous experience is part of the emotional life of the organism, and since the emotional life of the organism must surely be affected by its material condition, it is plausible to believe that the frequency, intensity and object of numinous experience will be in some way effected by material conditions. (This relationship will not be linear, or in any other way simple, and its most salient feature will be time lag.) Material conditions are in some degree a function of structure, and it is reasonable to expect that the willingness or even the ability of the congregation to give numinous support to the ultimate sacred propositions sanctifying the structure ordering their lives will be adversely affected by protracted periods of unsatisfactory conditions. Dissatisfaction may be signalled by withdrawal from participation in rituals in which connections between the sacred and structural orders have been symbolized in the past. It may be signalled more radically through participation in other rituals in which the same or different ultimate sacred propositions are connected by prophets to different or revised structures more in accord with the desires, if not the adaptive interests, of the communicants. In sum, limitations may be placed upon the differentiation of structure and upon structure's operations by its need to maintain communitas. Not only is communitas generated in rituals but through ritual indexical information concerning the state of the relationship between communitas and structure is broadcast. Ritual is an intrinsic part of an ultimate corrective loop in which the sacred and the numinous, structure and communitas, the rational and the affective, the discursive and the non-discursive are united in whole living systems. Human adaptation resides ultimately in such wholes, for through their mobilization the ambitions of separate men may be subordinated to common interest while at the same time the operations of society may be reviewed and tempered by the psychological and physical needs of the humans who compose it.

WHOLENESS AND HOLINESS

To summarize, ritual subsumes communication acts ranging from simple and ephemeral transactions lasting for only a few seconds to prolonged and complex events in which a number of channels are used, often concurrently, not only to transmit but to integrate complex, subtle and highly varied information. The messages transmitted in complex rituals are not limited to those separately concerned with the current states of the participants (indexical messages) enduring social orders (ceremonial messages) or timeless cosmological orders (sacred messages). There is in ritual a more general message about relationships among these various categories of message, and about relationships among their personal, social and ideological referents. In the course of rituals personal support of social and cosmic orders are expressed, and social orders in which the personal may operate are symbolized, as are ultimate sacred propositions which certify indexical messages, the social order, and changes in the social order.

The integration of these messages into a message of higher order does not rest simply upon the use of a number of modes of transmission, but upon the integration of these modes of transmission as well. We have alluded to some of the body's uses and also to the use of ritualized words. We have suggested that they are not altogether alternative modes of communication but, having somewhat different formal characteristics and evocative powers, they complement each other. There are other modes that we have hardly mentioned that communicate with the body, the voice or both — singing, keening, chanting, speaking in tongues, beating drums, the use of mask and costume — that may carry at once indexical, ceremonial and sacred information. Yet others, separate from the self and apparantly changeless — carved or painted images, the interiors of Cathedrals — carry ceremonial and sacred information with great force. Although some rituals are ascetic and attenuated, in others participants are simultaneously receiving and transmitting information over a range of channels. All of this information is not discursive, and participants are affected and affect others emotionally as well as cognitively. It would, perhaps, be going too far to say that in their integration of the discursive and the non-discursive they come to communicate as "whole persons", but surely a larger range of their senses and sensibilities is involved than is the case in day to day communication, and these senses and sensibilities may at least seem to be more coherently or intimately related to each other than is ordinarily the case.

The meta-message into which all of the lesser messages of such rituals are combined by the integration, even orchestration, of the various modes of communication and of discursive and non-discursive responses to them, is one of integration itself, one of unity or wholeness. It is perhaps of interest that the words "whole" and "holy" have a common root, the old english hale, from which the word "health" is also derived; and we have already argued that the ultimate corrective loops upon which adaptation depends inhere not in subsystems but in living systems as wholes. "Wholeness", "health", "holiness" and "adaptiveness" are not synonymous terms, but they do imply each other.

II RITUAL AS A STATE OF BEING

We began by proposing, as have many others, that ritual may be regarded as a complex mode of communication, but in elaborating upon this we enlarged our notion of ritual, or communication, or both, to include the understanding, also not new, that in some rituals a state of personal and social being different from that obtaining at other times may prevail. When discussion has been focused upon the person such terms as "grace" (G. Bateson 1972a, James 1903) have been used to designate this condition. Durkheim, more interested in society, spoke of the social condition as "effervescent", and we have already put the term "communitas" to use, although our usage may be somewhat more restricted than Turner's.

Intermediate, perhaps, between personal and the social foci in their implications are Maslow's terms "being-cognition" and "peak-experience" (1964), but too much should not be made of the personal-social distinction since one of the important offices of some rituals, at least, is to obliterate it.

GRACE

Bateson tells us that Aldous Huxley used the term "grace" to designate a quality of naivete and simplicity inhering in both his conception of God and in the behavior and communication of animals. This behavior and communication is in its nature free of deceit and purposefulness, which are, Huxley said, among the products of human reason. "In terms of this contrast . . . God resembles the animals rather than man; He is ideally unable to deceive and incapable of internal confusions (1972:128)," and therefore "In the total scale of beings . . . man is as if displaced sideways and lacks the grace which the animals have and which God has" (p. 129). The problem of grace, says Bateson, is "a problem of integration and what is to be integrated is the diverse parts of the mind — especially those multiple levels of which one extreme is called 'consciousness' and the other the 'unconscious'. For the attainment of grace the reasons of the heart must be integrated with the reasons of the reason." (p. 129). In our terms, grace is a state in which the cognitive and affective, the discursive and the non-discursive the sacred and the numinous are unified. Such unification is also central to the conception of grace proposed by William James, who contrasted it with morality as a basis for social life. Moral codes are products of reason, and responsibility for adhering to them rests with each man, who, to impose them upon his conduct, exercises his will in a contest with his drives and, possibly, his general experience as well. But in a state of grace the effort of will is replaced by an enthusiasm that need not overcome the drives that moral exertion had to tame because it receives their support. "The saint", says James, "runs out to accept the divine decrees." James regarded grace to be superior to morality not only because it may be more effective (which is questionable), but because morality is inclined to become self-serving. This is not a characteristic of morality specifically, but is built into the very nature of conscious reason, which, lodged in individuals, functions to serve their private ends. One not only fashions concepts in conscious reason. It is in reason that one "rationalizes" and schemes against his fellows.

The notion of grace suggested by James and Bateson has considerable in common with what Maslow has called "being-cognition", a state which may be achieved in love making, religious experience and the contemplation of art. In contrast to rational "deficiency cognition", which is narrowly goal-directed, being-cognition is detached from personal goals and anxieties. In being-cognition the individual rises above himself, so to speak, to merge with something larger. In this condition, one in which his private purposes are not controlling he is more trustworthy, Maslow claims, than when he is guided mainly by his rationality. He is not only not in conflict with himself. He is not in conflict with his fellows, for he is in communion with them. He participates with them in communitas. We shall return to communitas and participation shortly.

ART, AESTHETICS AND RITUAL

Religious and aesthetic experience are explicitly associated by Maslow, and Bateson's remarks concerning grace are found in a discussion of art. The frequent association of art and ritual also strongly suggests similarity between religious experience and what Langer (1953) and others have called "aesthetic experience." The association implied here between art and aesthetic experience is not exclusive for our reactions to the beauties of untransformed nature may not feel very different from those we have to art. But we shall be concerned for the time being with art, and not with the contemplation of nature.

To Langer art is "significant form" and its significance is "that of a symbol, a highly articulated sensuous object which, by virtue of its structure can express the forms of vital experience which language is peculiarly unfit to convey (p. 32)." She means by "vital" to refer to the "dynamism of subjective experience (p. 31)," which she identifies with feeling and emotion. Vital experience, an immediate and unreflective primary process grasp of things, is inarticulate. But art provides a kind of "knowledge about" it. The artist, Langer says, does not and cannot convey to us through his art his vital experience itself. But he can convey to us his knowledge about vital experience, and insofar as his art is successful he does so. This "knowledge about" is neither the vital experience itself nor a discursive description of vital experience. It is that which emerges out of a more or less self-conscious (or self-unconscious) dialectic between vital experience and cognitive canons of order, canons that are amenable to discursive formulation, whether or not they are so formulated. The work of art itself, and artistic expression and perception remain, insofar as they are artistic, non-discursive, or at least not fully discursive. When we make art and when we confront art we do not attend to it as if it were mere discourse. We "experience" it or "feel" it. But it is not pure and naive vital experience to which we respond, and our response is not pure vital experience. As religious experience is not composed only of pure and naive numinous emotions but of such emotions ordered by sacred propositions, so in the experience of art vital experience is ordered by canons formulable in reason. It is of importance to note here that since humans differ in their emotional and cognitive structure those who contemplate any particular work of art will surely experience it differently.

Both aesthetic and religious experience arise from a synthesis of "the reasons of the heart with the reasons of the reason," and the higher order whole or holy understandings yielded by such experiences may be what is meant by wisdom, or even illumination. But be this as it may, works of art and religious rituals are similar in that they both provide frames within which such integrations may take place. Since this is the case it is easy to understand why it is that works of art so often have a role in presenting ultimate sacred propositions to the emotions of the faithful.

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It is well to remember that although art, insofar as it is art, is non-discursive (even when it is made of words), it often includes representations of objects available to our senses, as in poetry. And even when the work of art itself does not represent any specific thing, as in music, it is performed in a context — in a church, for instance, during a particular sort of ritual, such as a funeral or baptism. Since this is the case it is reasonable to believe that art focuses the diverse subjective experiences it is clearly able to evoke upon designated objects in the physical or social world, or in the realm of discourse. The objects focused upon may, of course, be representations of the divine, either portrayed in the work itself or expressed in its context. To put this differently, works of religious art evoke aesthetic experience and guide it to objects of thought which include what may be proposed by sacred propositions. These experiences may vary from one person to another (since they are indescribable there is no sure way of knowing). What is important, however, is not that a work always elicit the *same* response, but merely that it elicit *some* response. The object represented or the context may then affix a common label — reverence, awe, submission, sadness — to the varied subjective experiences of those contemplating it. This label provides each man with a socially significant and acceptable interpretation of his subjective state, an interpretation in which he is likely to identify himself closely with his fellows. Put in the converse, by providing a common form and label for them, a work of art may assemble the varied private experiences of individuals and unify and translate them into a publicly identifiable and possible socially significant consensus. Works of art have the capacity to relate humans varying widely in perception and affect to particular socially identifiable objects in what they take to be common ways. Whereas beautiful wild flowers or beasts or whole landscapes may invoke in us feelings comparable to those we experience in front of a painting they certainly were not deliberately fashioned to do so, and they generally do not function to aggregate varied subjective responses and translate them into socially significant categories.

We have been concerned with the use of art in ritual, rather than with the aesthetics of ritual *per se*, but we are led, nonetheless to a feeling of agreement with Mead and Bateson, who have expressed in their prefatory paper a suspicion that the aesthetics of fine arts and the aesthetics of ritual are different. As I understand it aesthetics of fine arts confine themselves generally to forms and relationships intrinsic to works of art. This is to say that aesthetics of fine arts are concerned with neither context nor representation. We, however, have been concerned with the relation, aesthetic or experiential, among context, representation and the formal aspects of works of art. We might note that we often characterize works of art (which is to say we label the quality of our response to them) as sad, say, or majestic or joyous or whatever. But our responses may be as much a function of appropriateness to what is represented, or of the context, as they are of forms intrinsic to the work. Although the relations among them are obscure it is surely the case that context, representation and form are not independent factors in and response to art in ritual. This is to say that in contrast to the aesthetics of "fine" or "pure" art, an aesthetic of ritual art would not confine itself to the work of art itself, but would be concerned with relations between the work of art and objects external to it — both those in its immediate presence — its context — and those distant in time and space to which it is connected by representation. Moreover, since the context of the work of art may include other works of art — for instance the context of the chant includes stained glass, sculpture, vestments and the cathedral interior an aesthetic of ritual must also be a "multi-media" aesthetic, or even holistic aesthetic.

While any work of art appearing in ritual may focus the varied subjective experiences of the many upon the same object, finer differences obviously distinguish the capacities of various art forms to fulfill such a function. Statues, paintings and buildings have the advantages of durability and immutability and their mere presence is likely to guide private experience to the enduring or eternal quality of whatever it is that they represent. Performing arts have different virtues. Obviously they enliven what they represent in ways that statues cannot, and since performances occur at particular times they not only guide the experiences of all of the members of the congregation to the same object, but they guide them to it simultaneously. Simultaneity must, almost by definition, be of importance in the generation of the tight and coherent interpersonal bonds characteristic of ritual communitas. And if the performance is one in which the congregation participates, the bonds of simultaneity are augmented by those of joint performance, which can surely be very strong. There is, first, the subjective experience of performance itself. The members of the congregation may experience the sacred propositions or their representation not only with their eyes or ears but arising out of their own bodies in song, and in participation in ritual dance, Langer has argued (1953), people achieve a kind of kinesic awareness of powers beyond consciousness operating within themselves. But the subjective experience is not merely one of performance. It is also one of coordinating one's performance with the performances of others. The subjective experience is one of joint participation. In such moments of joint participation groups of men may coordinate their behavior to degrees that are rare in ordinary life. Indeed, the degree of coherence achieved on such occasions is, perhaps, more characteristic of single organisms than it is of social groups in their ordinary states, and it is not surprising that participants sometimes feel that they are losing their personal identities and merging into something larger. This degree of coherence probably cannot be long sustained by social groups, but its generation in occasional rituals may be necessary to sustain the differentiated structures in terms of which societies conduct their day to day affairs.

It is obvious that the profoundity of participation in ritual varies from society to society, ritual to ritual and person to person. Although we have been discussing here profound participation in dance and song westerners know from experience that ritual participation often requires of the congregation no more than their presence. Be this as it may, given our earlier discussion of the minimal indexical messages communicated in ritual, ritual *always* entails participation in some degree. Thus, it may be suggested that an aesthetic of ritual art or ritual as art would differ from aesthetics of fine arts not only in concerning itself with context and representation, and in being a multi-media aesthetic, but also in being an aesthetic of participation. This is to say that the participant himself, in his relation to other participants, to the representations occurring in the ritual, and to the general ritual context is part of the total form with which an aesthetic of ritual would be concerned.

PARTICIPATION

Our use of the term "participation" is not altogether dissimilar from that of Paul Tillich. Central to his thought is "ultimate concern", which he takes to be the basis of being or not-being, not in the sense of physical existance, but as far as the meaningfulness of existance is concerned (1951). The term "ultimate concern" is bivalent. It refers at once to an attitude and to the focus of that attitude: "The ultimate of the act of faith and the ultimate that is meant in an act of faith are one and the same." There is, thus "a disappearance of the ordinary subject-object scheme in the experience of the ultimate, the unconditioned (1957:11)."

A man's ultimate concern is, to use another of Tillich's terms, "the Ground of his Being." This is to say that in ultimate concern the mind participates in the Ground of its own Being, which Tillich identifies with God. In this view God is not "wholly other", as Otto would have Him, but is within the individual, and it is by turning inward that one finds Him. But at the same time that God is the ground of the individual's Being he transcends the individual, for he is the Ground of All Being, or "Being-Itself." The finite individual by discovering the Ground of his own Being discovers himself to be part of, or continuous with, or to be participating in, the immensity of Being-Itself. He discovers himself to be part of an infinite God. Social scientists may take this to be the statement of a profoundly religious informant, rather than an analytic proposal. But regardless of its nature, the sense of participating in Being-Itself seems to approximate what Maslow meant by "being cognition" which, he suggested, prevails in the contemplation of art and in ritual participation. Tillich was not, of course, concerned primarily with participation in public ritual, but his formulation, supported by Maslow's, suggests that participation in group performances in religious rituals may engender a feeling of actual participation in Being-Itself, a being continuous with the being of other participants, an experience, that is, of intense communitas.

We may turn here to one of the questions Mead and Bateson ask in their prefatory statement, namely whether ritual may "provide a form of learning that would teach man more of a sense of responsibility for the environment." I take it that an adequate sense of responsibility for the environment would lead men to participate in ecosystems in such a way that those ecosystems could persist more or less indefinitely. We need not go into the difficult question of what is meant by the persistance of an ecosystem. What is important here is that frequently contradictions develop between the short or not so short term purposes of men and the long term interests of the larger social and ecological systems in which they live. While it would be foolish to deny that human purposes are sometimes short sighted and narrowly self-serving, such contradictions may be an inevitable outcome of mere-consciousness. Consciousness is, after all, lodged in individuals, and its view of the world cannot help but be shaped by their interests, and more or less limited by their relatively short mortal spans. It is ordinary consciousness that informs each man that he is totally and irrevocably enclosed by his skin and it is in ordinary consciousness that rationality in the economic sense is lodged. It is by exercise of ordinary consciousness, or common sense, that men apply their scarce means to differentially graded ends in order to maximize their positions vis a vis the rest of the world. But, as Gregory Bateson has observed (1972b), the problem is not only that such rationality pits men against their societies and ecosystems. Purpose, which aims toward the achievement of specific goals, does not usually take into account the circular structure of ecological and informational systems, and indeed, of cause and effect generally. This shortsightedness, or rather this linear-sightedness, of conscious purpose almost inevitably leads to disruption.

The disruptiveness of human purpose must be fairly recent. It could hardly have endangered most of the ecosystems in which men participated as hunters and gatherers, for in such systems the effects of men's purposes are limited by factors outside of human control. It was probably only with his elevation to the role of ecological dominant, a role he began to assume with the emergence of plant and animal cultivation 10,000 or so years ago, that the purposefulness of men became seriously disruptive. Cultivation demands that complex climax communities composed of plants and animals well adapted to each other and to the non-biotic habitat be replaced by simpler communities composed of smaller numbers of species selected by men for their apparent usefulness, and not their adaptedness. Such communities are, of course, likely to be less stable than the climax communities they replace. As dominants men are burdened not only with the need, common to all organisms, to fulfill their own biological requirements. They are also burdened by the responsibility to maintain exceptionally delicate ecosystems of their own devising. Thus ecological responsibility, by which I take it that Mead and Bateson mean responsibility for the regulation of the ecosystems in which they participate, requires that men give priority to the long term interests of ecosystems rather than to their own unbridled immediate interests.

But in a world governed by such maxims as "Nice guys finish last" it is asking too much of ordinary discursive reason alone to persuade men to such altruism. Discursive reason may provide us with knowledge about the structure and function of ecological systems, and with abstract reasons for complying with ecological principles. But such knowledge and its attendant reasons are likely to be overcome by what the economists mean by "rationality" before they have maintained compliance with such principles for very long. Sustained compliance must require a sense of participation.

To participate is to act as part of some larger whole. To act as part of some larger whole obviously requires that one be aware both of the existance of the larger whole and that one is in fact part of it. It requires that one become aware that the envelope of the skin is not a total or irrevocable boundary and that entities from which one is separated by the evidence of the senses and by competitive rationality are joined with the self into wholes — societies and ecosystems — which are not in their nature directly perceptible. It requires acquiescence to a general and enduring interest that may oppose, and certainly transcends one's own immediate interests. Participation, that is, requires that ordinary consciousness be transcended. We have argued that in ritual ordinary consciousness may be transcended. In ritual participation the individual may, in fact, feel that he is acting as part of some larger whole, the "Ground of his being," or "Being-Itself," that for the time being becomes palpable for him.

It is important to observe here that the understandings achieved in states designated by such mystical phrases as "participation in Being-Itself" may often involve insights (albeit non-discursive or mystified) into perfectly natural aspects of the social and physical world, Durkheim (1912) argued this many years ago, of course, and Gregory Bateson's recent (1972b: 448ff) discussion of mind casts further light on those aspects of nature which may be grasped by ritual's insight. Bateson suggests that the minimum unit of idea is "a difference which makes a difference," a bit in information theory. The elementary cybernetic circuits around which such units of information flow are the simplest units of mind. Mind, that is to say, is immanent in cybernetic systems. While it is surely the case that some such circuits are contained entire within individual consciousness, the mind of the individual is more comprehensive that his consciousness alone, as Freud long ago showed us. We also know directly from experience that our information processing circuits include more than our brains because in response to some information we experience changes in our visceral states, and these changes enter into the computations that produce our total reactions to the information received. We further imply here that the information circuits which are significant to us include not only more than our brains but more than the selves which our skins bound. We are dependent upon circuits that include portions of our environments; some of them include many individuals, often individuals of other species. Whereas animals are, as a rule, quite separate from each other as far as metabolism is concerned they are less autonomous with respect to information processing. This is to say that matter-energy processing systems and information processing systems are not coextensive. But the adequate functioning, indeed the very survival, of metabolically autonomous individuals as well as societies is contingent upon supra-individual information processing circuitry immanent in social and ecological systems, and disruptions of such circuits are likely to lead to results not formally dissimilar from the effects of brain lesions or neurosis. In the absence of reliable information, total systems or their parts cease to be self-correcting. The doctrine of I-Thou which Buber (1970) proposes as an ethical dictum is in fact an adaptive imperative, and it does not denigrate Tillich's concept of the "Ground of Being" or "Being-Itself" to suggest that it accords with the structure of information processing in nature. G. Bateson has recognized these similarities.

> ". . . there is a larger Mind of which the individual mind is only a subsystem. This larger Mind is comparable to God and is perhaps what some people mean by "God" but it is still immanent in the total interconnected social system and planetary ecology (1972c:461)."

Participation in this larger mind has implications for aesthetics and, through aesthetics, for our relations with nature. We noted earlier that our reaction to a rose, say, or a landscape may not feel different from our reaction to a great painting. Bateson suggests that " 'The primrose by the river's brim' is beautiful because we are aware that the combination of differences which constitutes its appearance could only be achieved by information processing, i.e., by thought (1972c: 465)." If the concept of mind as immanent in ecological systems does not obliterate the distinction between art and nature it certainly blurs it. At the very least it gives fresh import to the notion, always taken as metaphorical, that Nature is a work of divine art.

Finally, the sense of participation in the larger mind may help to overcome the limits mortality is inclined to impose on the goals of those who know they will die, for,

> ". . . the very meaning of 'survival' becomes different when we stop talking about the survival of something bounded by the skin and start to think of the survival of the system of ideas in circuit . . . Socrates as a bioenergetic individual is dead. But much of him still lives as a component in the contemporary ecology of ideas (1972c:461)
> . . . The individual nexus of pathways which I call 'me' is no longer so precious because that nexus is only part of a larger mind (1972c:465)."

In sum, since participation in ritual may provide the communicant with a sense of participation in a larger mind, that is to say in entities more encompassing than the self that is set apart by ordinary consciousness I endorse Mead and Bateson's suggestion. Ritual may indeed provide a form of learning uniquely appropriate to the task of teaching men a sense of environmental responsibility.

III THE LIMITS OF RITUAL

In the first section we discussed the meanings communicated in ritual and how they are communicated and in the last section how it is that ritual participation is meaningful. But it may seem to us that although the virtues we have ascribed to rituals may be ascribable to those of the ancients or the exotics they are strange to the mainstream of the contemporary west. We have argued that through ritual human lives can be made subjectively more meaningful than themselves by being referred to, or seeming to participate in, entities more encompassing and enduring than themselves. But in modern usage the term "ritual" is sometimes used to refer to empty or meaningless or even dissembling form, and the rituals we attend, far from investing us with a sense of the numinous, frequently bore us.

Both Wilson (1973) and Wolfenstein (1973) in this symposium have suggested factors contributing to the obsolescence of rituals, and no doubt others could be added. We would argue that it is a normal aspect of social change or evolution for rituals to become obsolete, and it may be suggested that adherence to rituals that have become irrelevant to prevailing social conditions is likely to engender boredom and even anomie, rather than communitas. The meaningful is degraded into the meaningless through participation in rituals that time has made irrelevant. But we must not confuse relevance to the times with the times themselves and must remember that an important aspect of ritual's relevance is that it relates the time and those acting in the time to the past and to the eternal. Rituals should neither be easily abandoned nor even easily refurbished to accommodate them to the tastes or interests of the moment, and I doubt whether there is ever anything to be gained by attempting to invent new rituals in response to current exigencies. New ritual forms may, and do, arise out of any time, but I think that they are seldom, if ever, successfully invented deliberately. Deliberately invented rituals are likely to exude not the odor of sanctity but the stink of hokum and self-service.

We may recall here that different aspects of ritual are differently susceptible to obsolescence. Ultimate sacred propositions which are themselves empty of political or social import are not as subject to obsolescence as other aspects of ritual and thus may provide continuity through extremely long periods of time and through even radical social transformation. In contrast, when ultimate sacred propositions do include material referents — say a divine emperor — their maintenance may require resistance to social change, and, further, they themselves are discarded when the social system changes radically. Since this is the case they can provide continuity only through limited social transformations and their entertainment is likely to discourage social change. This is to say that what Tillich has referred to as "idolatry" (1951) absolutizing the relative, or overspecifying the absolute — is non-adaptive.

We have, by implication at least, been making a distinction between rituals that are merely obsolescent and those that are degraded, and we have been arguing that the performance of degraded rituals — those that continue to be performed after they have become obsolete, those hoked up for an occasion, idolatrous rituals — reduces the meaningful to the meaningless and dissolves communitas and, through communitas, structure, into anomie and self-service.

But is it not only rituals but ritual itself that has become obsolete? Is it the case, as Wilson asks, that in the large scale and heterogeneous world in which we now live ritual, which developed in a world of small scale and relatively homogenous societies, can no longer effectively reconcile man and man, man and group, group and group, or human group and ecosystem? We shall return to the matter of efficacy shortly, but first we must note that whether or not they are effective rituals seem to be generated constantly. This is to say that newly defined behaviors, or behaviors that previously were not formalized, continually come to be formalized, to carry indexical, and perhaps ceremonial and sacred, meanings, and to be invested, in some degree, with communitas. Among those we have seen emerging in recent years are the passing of the cigarette when pot is smoked, the appearance of pentecostalism among young Catholics, the Woodstock phenomenon, the teach-ins and the anti-war demonstrations. In accordance with Turner's suggestion already cited it may be that there is some sort of innate propensity for ritualization, as there may be for language, and if meaningful living rituals are not available new ones will somehow emerge. Since all learning organisms must organize their experience, that is, invest their worlds with meaning, it is at least plausible to suggest that there is some sort of appetite or drive for ritual, as part of a general need for meaning, for ritual is a mechanism through which certain sorts of meanings (non-instrumental, non-discursive, non-specific) are grasped. Or it may be that there is an appetite for communitas in the fulfillment of which new rituals may emerge if the social order as it exists does not fulfill it.

It is of importance to note that the participants in the rituals that have been emerging recently have been young people for the most part. It is possible that new rituals may emerge as a response to partial failures in the ritualization of ontogeny. That is, those who have become sufficiently ritualized in the course of their ontogeny to have become social beings with a need for further ritualization, but who are nevertheless unable to accept the further ritualization that would have transformed them into full members of the society as represented by those ritualizing them, may be the chief innovators of new rituals. This is to say that generation gaps are among the most important birthplaces of rituals. If the young cannot allow themselves to be ritualized to the society of their elders they will attempt to ritualize themselves to each other. Further, it is plausible to assume that they refuse traditional ritualization, deliberately or not, because they cannot bring themselves to believe in it (which is to say that it doesn't evoke their numinous responses). They may no longer believe in it because the disparity between the sacred and ceremonial information transmitted in the rituals and their experience of the social order is so great that they take the ritual messages to be falsehoods. Thus, new rituals also arise out of credibility gaps to which the young, not yet fully ritualized, are perhaps most sensitive.

The ritualization of ontogeny not only provides a means for maintaining the continuity of society, but possibly for transforming it as well. Its very failures may be part of its self-corrective operation, for our discussion suggests that the process of ritualization, to be successful, should in some degree fail. The child should be sufficiently ritualized by his elders to behave in socially positive ways, but not so rigorously ritualized by them that he cannot accept new rituals arising out of changed conditions. This balance between sociability and flexibility may demand that the meanings and committments imparted to him in the course of his ritualization should be high in generality but low in specificity. The problem is that the general is learned from the specific and it may be difficult to prevent the child from becoming imprisoned by the specific.

We may now return to the matter of the continued effectiveness of ritual as part of the corrective apparatus through which societies maintain and transform themselves. We have made clear what we take to be within the compass of ritual's abilities and would now call attention to what lies outside them, for tacit misunderstandings of what ritual can accomplish seem widespread. Ritual, we have said, invests the world and those it ritualizes with meaning, and it generates the communitas which structure may require for support. But it itself does not create structure. While the communitas generated in ritual and the meanings which inhere in it may provide the commitment and the motivation necessary to undertake actions required to cure social and ecological ills, ritual itself is not, or is at least not usually, such corrective action. Misunderstanding of this distinction leads not only to failure to attain the goals that only the sustained corrective actions undertaken by structure can achieve, but also to a degradation of ritual from the meaningful to the meaningless or substitutive or dissembling.

We may recall here the great ecology teach-ins of the spring of 1970. At the University of Michigan on March eleventh of that year, after some days of symposia, seminars and public events (for instance the clean-up of local parks and roadsides with the non-returnable bottles recovered being dumped on the lawn of the Pepsi-Cola plant) close to fifteen thousand people jammed into the basketball arena to hear such speakers as Barry Commoner, to listen to rock, and to sing. The communitas of those days brought together garden club ladies and long-haired students who joined in pronouncing themselves to be saved by their new ecological illumination. Since conversion of the individual to an ecologically sound way of life was taken by many of the participants to be synonymous with correction of ecological disorder it is not surprising that when the great act of expiation was over so was most ecological activism. In addition to those of its dangers noted by Heider (1973) in his contribution to this symposium ritual, catharsis may seem to be corrective action; at least it may provide an emotionally satisfying substitute for sustained corrective action in the outside world. Be this as it may, by October 1971 Enact, the organization that had sponsored the teach-in, was reduced to fifteen members while a related organization confined itself to running a small ecology information center and to collecting non-returnable bottles for recycling, an activity which, of course, facilitated the continued manufacture of non-returnable bottles. To the extent that rituals lead individuals to assimilate to their own responsibility the disorders and injustices of the world and then atone for them rather than correct them, ritual can form part of an oppressive and reactionary apparatus, as Marx would have it (1843). To the extent that the processes of ritual may relieve anxiety without ameliorating the causes of anxiety they bear formal resemblence to neurosis, as Freud (1907) would have it. To the extent that rituals contribute to the maintainance of social and ecological disorder

while appearing to correct it they are not far from what de Rougemont (1944) called "diabolical lies," lies which tamper not only with truth, but with the canons of truth.

Ritual can generate the communitas that may in the long run be necessary to support structure, but it cannot do structure's work and may even mislead it. Moreover, structure's putative need for communitas does not guarantee that the good, the true, the beautiful, the holy or the adaptive will triumph. Communitas itself may be demonic. It must not be forgotten that communitas prevailed at the Nuremberg rallies and it may always be easier to develop meaningful rituals and to generate communitas in totalitarian societies than in democracies. This may well be one of fascism's most seductive charms. In contrast, one of western capitalist democracy's most important problems may well be an ideology that emphasizes the autonomy of the biological individual to such an extent that it becomes difficult for it to recognize significant entities much larger than itself, let alone to have any sense of participation in them. Whereas fascism may put a monolithic communitas to dark ends capitalist democracy may not generate communitas at all.

With the limitations and dangers of ritual and communitas in mind I would suggest that the contemporary problem is not so much "a search for meaningful rituals (Mead and Bateson 1973)" per se. It is, rather, a search for a decent, humane and adaptive social order, an order in which, among other things, the various ritual processes discussed in this paper would be allowed free play. I cannot begin to discuss the characteristics of such social orders in this statement but suggest that this matter is one of the most important topics for the conference's attention. We might only recall, in concluding, that the essence of ritual as both communication and state is the participation of the performer in a larger whole, and that ultimate adaptive processes inhere in such wholes. Adaptive processes, to put it a little differently, are immanent in cybernetic circuits which bind together not only metabolically autonomous individuals, but even members of different species and non-living substances. It is through the operation of such circuits that private interests are subordinated to those of society and ecosystem while at the same time individuals are protected from oppression by the larger system, of which they are parts, and it is through the operation of such circuits that whole systems transform themselves in response to changed conditions. Needless to say, contemporary western industrial societies are not characterized by such adaptive structure, and because of their cybernetic deficiencies they are not only not self-correcting, but also seem, at least to many people, not to be very satisfying milieus in which to spend one's only life. This implies that if we could construct adaptive social orders, orders which not only allow but require the meaningful participation of individuals we would not only be constructing self-correcting societies but societies in which it would be more satisfying to live. I would suggest that in such societies "meaningful rituals", which would replace "apathy, anxiety and boredom" with "freshness, trust and wonder (Mead and Bateson 1973)" would emerge spontaneously to support, rather than to oppose the social order. ■

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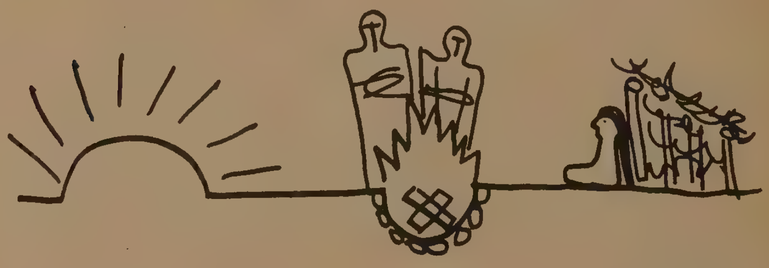
Blessing Way Ceremony, Puberty Rite

BY MAUD OAKES

Illustrations by Gloria Churchman

Not until a Navaho Indian girl menstruates for the first time is she allowed to wear her hair up like a Navaho woman. This happens after a Blessing Way Ceremony has been given over her. Only her family, the Medicine-man and a few close friends, of which I was one, were invited to attend the Ceremony.

In the early morning of the special day, her father and brother dug a hole in the earth near the door of the ceremonial hogan which always faces east where the sun rises. As the first rays of the sun touched the nearby overpowering red mesa, the hole was lined with rocks and a fire kept going in it from sun rise to sun set. The girl, a beautiful girl with long black hair sat outside the ceremonial hogan which was made of pine boughs like a lean-to.



After luncheon the girl prepared the batter for a special cake for the Navaho Sun God. It was made of female yellow corn meal, baking powder, sugar and water. Her mother helped her beat the batter and I was also allowed to help.

Just before the sun set the men removed the hot coals from the hole. Two corn leaves pointing east and west and north and south in the form of a cross were laid on the bottom of the hole. It was then lined with corn leaves.

The girl poured the batter into the hole. On top of this she laid two more leaves pointing to the four directions in space. Then more corn leaves, and finally hot rocks.

It was Yvonne Rand who told us about Maud Oakes' Blessing Way account. Yvonne has a thirteen-year-old daughter, Hillary, whose puberty she would like to honor with some sort of ceremony.

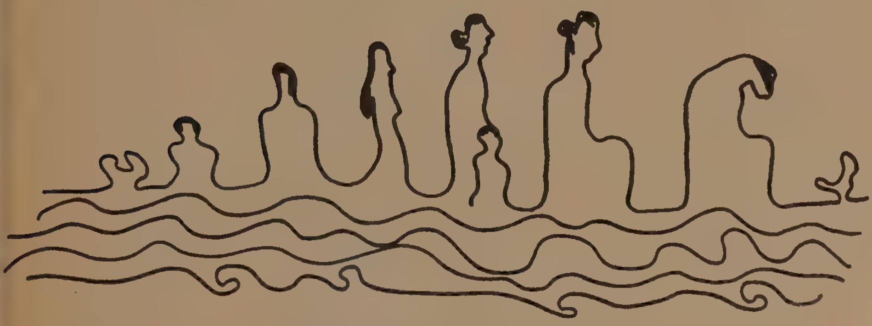
Maud Oakes has been a Jungian observer of native American ceremony for decades, cf. her Two Crosses of Todos Santos: Survival of Mayan Religious Ritual *and* Where the Two Came to their Father: A Navaho War Ceremonial *— both Bollingen books from Princeton University Press.*

The rite described here took place in the 1920's. Rosemary Menninger attended a recent Navaho Blessing Way that had only minor differences. One was, instead of running toward the sun chased by young men, the girl and her mother ran for miles together, until the mother got tired and the girl ran on leaving her behind. Yvonne thinks Hillary would go for that.

—SB

The guests dressed in their best and covered with jewelry of turquoise and silver entered the hogan. We laid our coats or blankets in a pile inside the doorway. The girl walked in sunwise and sat on the south side. The Medicine-man and his ceremonial equipment on the west side. At nine o'clock the all night ceremony commenced.

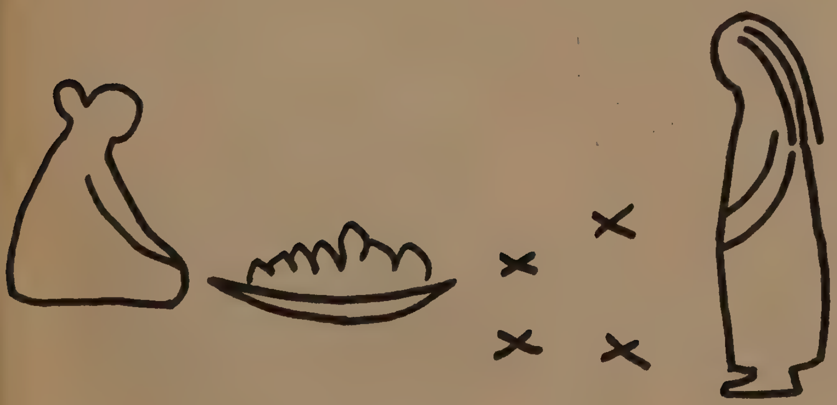
The Medicine-man had a strong handsome face. Around his head was a colored band holding his grey hair in place. The prayers and songs he sang throughout the night were believed to be the same as those sung over their great Mother Goddess "Changing Woman" when she first menstruated. She, who changes with the seasons, she who is born a babe in the spring and dies an old woman in the winter, to be reborn again.



The songs were full of nature sounds and nature power. All night long sacred pollen was sprinkled on the girl by the Medicine-man and also pollen was given to her to eat.

As the night progressed I could feel the sacred power that filled the hogan. I felt love for my Navaho friends and happy to be with them.

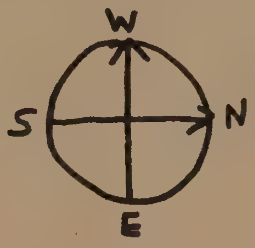
The most beautiful woman, chosen for her beauty within and without, had been asked to wash the girl's hair, a purifying rite. She laid the medicine basket in the center and filled it with water and beat the water with yucca leaves making the suds. On the floor she made four corn meal pollen crosses. The girl knelt on two of them and placed her hands on the other two, which brought her head over the basket. Just before the cock crowed her hair was washed and sprinkled with pollen.



At the first streak of light, the girl with her wet hair hanging down her back ran out in an easterly direction into the beauty of the dawn. In pursuit were several young men who had been told to pretend they were catching her. In a short time she rushed back and entered the hogan. Her hair was then done up by the beautiful woman.

As prayers were said and songs chanted the girl laid on her stomach on top of the pile of coats and blankets facing east. The woman sort of molded the girl's body, similar to a massage, molded her body for womanhood.

As the sun rose we all went out to watch the girl cut the cake. The stones and leaves were removed. She cut from east to west and from south to north leaving a bit of each section in the hole.



Half of the cake was given to the guests, one quarter to the Medicine-man, one quarter to her family, and a bit of this to her young man. What remained in the hole she mixed with the earth and left it there covering it with more earth. For what the earth has given was returned, symbolizing life's great rhythm of creation and destruction. ■

LE RONDE

BY HAROLD MOROWITZ

Student:

What is life?
What is reality?
Answer please sir
Answer with fidelity.

Don't tell me
Of birds and bees
Spare me the things
That everyone sees.

Don't tell me of genera
And matters specious
I want to probe
Beyond the niches.

Biology Professor:

You have come my son
To a very wrong place
You go beyond
The questions I face

I only deal
With selected fauna
And physiological changes
Caused by a sauna.

To probe beneath
The diversity I teach
The biochemist
Extends his reach.

Student:

What is life?
What is reality?
Answer please ma'am
Answer with fidelity.

Don't tell me
Of Francis Crick
And DNA
Turns its trick

Don't tell me
Of an amino acid
I search beyond
That which is tacit.

Biochemistry Professor:

My laboratory tools
Are not that wise.
Metabolic pools
Are what I apprise.

You want to go deeper
Than I can plumb;
The organic chemist
He's the one.

Student:

What is life?
What is reality?
Answer please sir
Answer with fidelity.

Don't tell me
Of electrons pi,
Of sigma orbitals
And where they lie.

Organic Chemistry Professor:

Why come here
To seek such questions?
My retorts don't
Produce suggestions.

I synthesize
Molecular types,
Go to the physicist
With your gripes.

Student:

What is life?
What is reality?
Answer please sir
Answer with fidelity.

Don't tell me
Of waves and particles
And where to find
Journal articles.

Don't discourse
Upon the quark
I really want
Out of the dark.

Physics Professor:

I see your point
And I regret to say
I'm not the one
To point the way.

I only deal with
Energy and matter
The mathematician
Goes beyond the data.

Student:

What is life?
What is reality?
Answer please ma'am
Answer with fidelity.

Don't expound
An existence theorem.
Frankly, Professor
I can't bear them.

Nor Abelian groups
Or algebraic rings
I want to know
The nature of things.

Mathematics Professor:

My world is made
Of line and point
Your query really
Gets me out of joint.

The theorems I prove
Limit my move
By the spirit of old Immanuel Kant
Categorical logic is what you want.

Student:

What is life?
What is reality?
Answer please sir
Answer with fidelity.

Don't tell me
How to negate
As was done by
An ancient prelate.

Syllogisms are fine
To prove a law
I'm seeking beyond
The logical flaw.

Logic Professor:

Explain a truth table
I surely am able.
On reality young sir
I must demur.

Propositions are my thing
Not closing up the ontological ring
I'm only good at tautology
Seek your answer in epistemology.

Student:

What is life?
What is reality?
Answer please sir
Answer with fidelity.

Don't tell me
Cogito ergo sum
I knew of that
When very young.

Spare me, I pray
Your philosophical range
I want to know
Why things are strange.

Epistemology Professor:

How do we know
The things we know
That is as far
As I can go.

To get beyond
My range and ken
You must inquire of
The psychology of men.

Student:

What is life?
What is reality?
Answer please ma'am
Answer with fidelity.

Don't tell me
The statistical stuff
I really know
Just when you bluff.

Don't overwhelm me
With ego and id
I'm desperately after
Where the secret's hid.

Don't tell me
Of resonant forms
I want to extend
The textbook norms.

Psychology Professor:

There are some things
That I can measure
They are not the things
That you treasure.

If you want to go deeper
Behind the curtain
See the biologist
Of that I'm certain. ■

Business

Unfree money

The first generation of directors of POINT — the foundation which publishes the WHOLE EARTH CATALOG & EPILOG & this magazine — was required upon departure from the Board (obligatory after 3 years) to write a letter to their successor summing what they learned being a funder. Each of the original six directors gave away some $150,000.

The passion below is my departure letter to my replacement.

Incidentally, POINT nowadays barely has funds enough to maintain its publishing. All my advice to Jan on giving money is now academic.

— SB

March 21, 1975

Ms. Jan Mirikitani
San Francisco, California

Dear Jan:

My esteemed replacement on the POINT board, I scarcely know you, so you'll know to take none of the ravings which follow personally. I'm admonishing myself after the fact.

I don't like the idea of free money. It's no surprise then that I did a poor job of dispensing it. The self-fulfilled prophet.

The idea of free money, as I understand it, is that it is possible and desirable to do good. With money. Which expects nothing in exchange. That's four degrees of falsehood right there. A fifth asserts that the person giving the money will also be improved.

The truth is that it is impossible to do good and wicked to try, especially with the universal acid of money. Furthermore nothing, ever, goes in one direction only. And people who give money away are routinely corrupted by the act, its fruits, and by the blinkered philosophy that supports the act. (We all were.)

So are the recipients. Damn few grantees ever hold a job again. Instead of satisfying customers and employers with service, they learn to please funders, like gigolos. Style replaces substance. Their service is no longer for sale; they are.

All this from the worthy impulse to try and help someone (some help). Well you can't, so that's out. What you can do is be of use to someone, usually to the extent they are of use to you. I was too lazy ever to accomplish this — free money and laziness foster each other of course. I treated my POINT directorship as a sort of hobby (after that initial exciting period of helping design its operation — the three-year kickout, discretionary funding, and so on) and helped inspire a similar lassitude in my grantees.

It usually went like this: someone would call or write or mention some project or person that pushed one of my buttons. I would then fantasize what I would do with that project and duly fund the illusion — a projection of myself devoid of any personal commitment (this was easiest to do with total strangers). The recipient would either try to match my projection, and lose themself, or go ahead and be themself and disappoint me — often both.

I did know fairly quickly that you mustn't fund a capable person without an excellent idea (theirs) attached, or fund an excellent idea without a capable person carrying it. A measure of requisite fanaticism is whether they'll go ahead anyway without your money.

What I should have done in addition is take the time and commitment to be sure I got something good out of every deal, every grant. The best ones — Demise Party, Stephanie's salons, New Alchemist's research, a few others — I did that.

On each of those, too, I was familiar going in. We knew each other. The money was a small segment of a broad band of relation between us. I did learn one thing about saying no or yes, now that I think of it. Never let anyone ask you for money. If they do, a flat quick permanent no is the best response. Better that someone in the middle asks — a mutual friend, someone apart from the proposed project, perhaps another POINT director — anyway, someone you can deal with straight. Let them handle the diplomatic part. (Imagine you have a serious disease. You ask a famous doctor to perform the necessary operation. If he tells you no, you're a lot sicker, maybe dead. But if a friend asks the doctor and gets a no response, the friend can research around, ask some other doctors, and come back to you with someone's yes. Or at the least, the friend can transmit the famous doctor's no without the guilt and lies you would get from him directly.)

Of course, it's not required that POINT grant anybody. The foundation has one non-profit service operation (income-producing) in the WHOLE EARTH EPILOG and CoEvolution Quarterly. It could do others. But let them start small. Grandiose projects (such as our $75,000 foray into Stockholm) die grandiose deaths and stink up the place for years. A project that starts small can learn its best usefulness, adapt into it. Big ones can't.

Nothing worthwhile happens quickly in this business. The happy surprises arise from large slow movements.

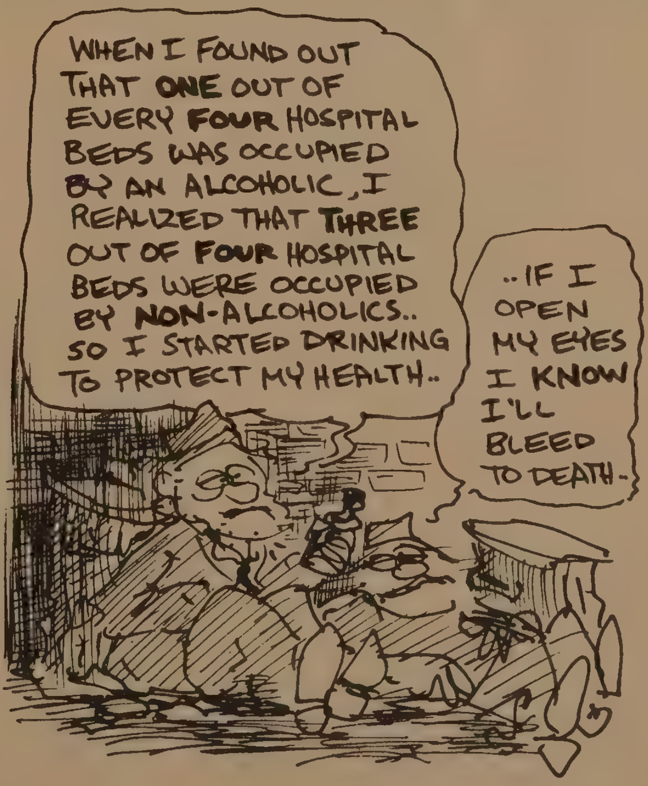
Stewart Brand

P.S. Blake says,

He who would do good to another
must do it in Minute Particulars.

This is the Harold Morowitz who said, "The flow of energy through a system acts to organize that system" in Energy Flow in Biology. *He probes Sagan's Conjecture on p. 7 of this CQ. "Le Ronde" was his response to a recent evening with Michael McClure and me.*

— SB


WHEN I FOUND OUT THAT ONE OUT OF EVERY FOUR HOSPITAL BEDS WAS OCCUPIED BY AN ALCOHOLIC, I REALIZED THAT THREE OUT OF FOUR HOSPITAL BEDS WERE OCCUPIED BY NON-ALCOHOLICS.. SO I STARTED DRINKING TO PROTECT MY HEALTH..
..IF I OPEN MY EYES I KNOW I'LL BLEED TO DEATH..

The Updated Last Whole Earth Catalog

Changes

These changes plus the ones in the Winter '74 and Spring '75 CQ's will bring your "Updated" LAST WHOLE EARTH CATALOG (13th, 14th or 15th printing, or the hardcover) all the way up to date — May, 1975.

All of these corrections, plus new cross-referencing and cross-indexing to the EPILOG are in the new 16th edition of the CATALOG, available July '75.

— SB

p. 3
Operating Manual for Spaceship Earth
Change $1.25 to $1.50

p. 4
Dymaxion World of Buckminster Fuller
Add postpaid

p. 6
Unexpected Universe
Change $1.95 to $2.45

p. 7
Full Earth & Whole Earth Rising
Both posters Out of Print

This Island Earth
Change $9.00 to $9.50

p. 10
Geology Illustrated
Change $12.95 to $13.50

Surface Anatomy
Change $12.50 to $8.50

p. 11
Kalliroscope
Defunct

p. 15
Notes on the Synthesis of Form
Change $2.25 to $2.95

p. 16
Dynamo & Virgin Reconsidered
Change $1.95 to $2.45

p. 17
So Human An Animal
Change $2.45 to $2.95

p. 22
Futurist
Change $10.00 to $12.00
Change "from: World Future, etc."
to World Future Society
P.O. Box 30369
Bethesda Branch
Washington, DC 20014

p. 29
Technics & Civilization
Change $3.95 to $4.25

p. 32
Concepts of Ecology
Change $5.25 to $5.95

p. 33
Science and Survival
Change $1.25 to $1.65

p. 42
If You Want to Save Your Environment
Out of Print

p. 47
Walden
Change $.75 to $.95

p. 50
Basic Book of Organic Gardening
Change $1.25 to $1.95

p. 53
Biodynamic Gardening
Add or Whole Earth

p. 59
Technology Review
Change $10/yr to $12/yr
Change $11/yr to $13/yr

p. 61
Pruning Handbook
Change $1.95 to $2.45

p. 82
Landscapes
Change $2.50 to $3.50

p. 83
Sketchbooks of Paolo Soleri
Change $27.50 to $12.95

p. 88
Architectural Design
Change $24.10 to $34/yr (monthly)

p. 97
Do It Yourself Encyclopedia
Change $9.00 to $13.50

Mason & Builders Guide
Change $11.25/set to $12.95/set

p. 98
Wiring Simplified
Change $1.00 to $1.39

p. 100
Florida Tipi Makers
Defunct

Goodwin Cole
Extensive price changes.
Write for new pamphlet.

p. 123
Human Engineering Guide
Change $13.75 to $12.50

p. 126
Science
Change $30/yr to $40/yr (weekly)

Scientific American
Change $10/yr to $12/yr (monthly)
Change "from: Scientific American etc."
to Scientific American
P.O. Box 5919
New York, NY 10017

p. 127
Popular Science
Change $6.00 to $6.94

p. 128
Machinery's Handbook
Change $19.00 to $20.00

Starret Book
Change $3.25 to $4.00

p. 132
Formulas Methods Tips & Data
Change $7.95 to $10.00

Henley's
Out of Print

p. 143
Home and Workshop Guide to Sharpening
Change $2.50 to $1.95

p. 147
Whittling and Woodcarving
Change $2.00 to $2.50

p. 150
Museum of Early American Tools
Change $2.00 to $2.95

p. 151
Book of Country Crafts
Change $3.98 to $4.00

p. 156
Jewelry Making
Change $2.75 to $3.00

p. 166
Made-Well Spinning Wheel
Change $52, $7, and $57 to $68, $7.50, and $75.

Your Handspinning
Change "postpaid" to "plus postage"

p. 170
Yarns (Colonial Textiles)
Change "The Sheldon's, etc."
to The Sheltons
82 Plants Dam Road
East Lyme, CT 06333

p. 171
Basketry
Change $1.25 to $1.50

p. 173
Standard Book of Quilt Making
Change $3.00 to $3.50

Whole Earth Epilog

Changes

These changes plus the ones in the Winter '74 and Spring '75 CQ's will bring your EPILOG (1st or 2d printing or the hardcover) to May 1975 currency.

— SB

p. 456
Pilgrim at Tinker Creek
Change $8.95 to $1.95
Change "from: Harper's Mag., etc."
to Bantam
666 Fifth Ave.
New York, NY 10019

I and Thou
Change $1.95 to $2.45

p. 457
Cosmic Connection
Change $7.95 to $1.75
Change "from: Anchor, etc."
to Dell Publishing Co., Inc.
1 Dag Hammarskjold Plaza
245 East 47th St.
New York, NY 10017

p. 463
Social Contract
Change $2.36 to $1.75

p. 493
Approved Practices in Soil Conservation
Change $8.50 to $9.25

p. 495
Hard Tomatoes, Hard Times
Change $4.95 to $5.95

p. 496
Practical Farm Buildings
Change $7.95 to $8.95

p. 499
Earth Garden
Change $4.50 to $7.50
Change "P.O. Box 111, etc."
to P.O. Box 254
Lithgow 2790, Australia

Schooling of the Western Horse
Change $5.95 to $6.95

p. 501
Good Food Naturally
Change $2.95 to $3.95

p. 502
Sunset Guide to Organic Gardening
Change $1.95 to $2.45

p. 504
The Complete Book of Gardening Under Lights
Change "from: Popular Library, etc."
to Popular Library
600 Third Avenue
New York, NY 10016

p. 512
The Barn
Change $25.00 to $9.95
Change "from: New York Graphic Society Publishers, etc."
to A & W Promotional Book Co.
95 Madison Avenue
New York, NY 10016

Handmade Houses
Change $12.95 to $5.95
Change "from: The Scrimshaw, etc."
to A & W Promotional Book Co.
95 Madison Avenue
New York, NY 10016

p. 513
Old Time Ceiling Fan
Change $78.00 to $89.00

p. 518
Reader's Digest Complete Do-It-Yourself Manual
Change $15.95 postpaid to $12.99 plus postage

Woodburners Handbook
Change $2.50 to $2.95

p. 520
What Wood is that?
Out of Print

p. 528
Producing Your Own Power
Change $8.95 to $3.95
Change "from: Rodale Press, etc."
to Random House, Inc.
457 Hahn Road
Westminster, MD 21157

p. 534
Low Impact Technology Group
Change Low Impact Technology Group
to Conservation Tools and Technology Ltd.
4 Lonsdale Road
London SW13
United Kingdom

p. 538
Undercurrents
Change $9.20 and $4.60 to $5.00/yr. (bi-monthly)

p. 546
Access to Crafts Books
Change K. R. Drummond, etc."
to K. R. Drummond
30 Hart Grove
Ealing Common
London W5 3NB, England

p. 560
Your Yarn Dyeing
Change $4.50 to $4.25

p. 570
English Smocks
Change "from: Craftool, etc."
to Craftool Co.
1421 West 240th St.
Harbor City, CA 90710

p. 571
Needlepoint
Change $1.95 to $2.45

p. 183
Effective Executive
Change $6.95 to $7.95

p. 190
Joy of Cooking
Change $1.95 per volume to
$3.95 (one volume edition)
Add also $8.50 hardbound

Purefoy Hotel Cookbook
Change $3.25 to $6.50

p. 191
Tassajara Bread Book
Change $3.50 to $3.95

p. 193
The Grub Bag
Out of Print

p. 213
New Aerobics
Change $1.25 to $1.50

p. 215
Complete Home Medical Encyclopedia
Change $1.95 to $2.25

p. 217
Folk Medicine
Change $1.00 to $1.25

p. 223
How to Avoid Probate
Change $4.95 to $5.95

p. 237
Win
Change $7.00 to $11/yr (weekly)

p. 253
Complete Book of Bicycling
Change $10.95 to $12.50

p. 254
The Way of the White Clouds
Change $3.95 to $4.75

p. 256
Last of the Mountain Men
Change $5.95 to $3.50

p. 259
Sioux Indian Saddle
Change $40 to $60
Change "Tolstoy Farm, etc."
to Tolstoy Handicrafts
Route 1
Ewall, WA 99008

p. 261
Craft Manual of North American
Indian Footwear
Change $1.95 to $2.25

p. 262
Light Weight Camping Equipment
Out of Print

p. 264
Fairy Dawn Sleeping Bags
Change "The Twenty Below" about
$23 to $56
Change "The Double" about $23
to $59

p. 270
Complete Cross Country Skiing
Change $6.95 to $4.95

p. 271
Cache Lake Country
Change $5.95 to $7.95

p. 272
Camping & Woodcraft
Change $6.95 to $8.95

p. 276
Golden Age Arms
Change Catalog price from $1.00
to $1.50

p. 299
Joy of Soaring
Change $5.75 to $5.25
Change "from: Soaring Society, etc."
to Aviation Book Co.
Box 4187
Glendale, CA 91202

Soaring
Change $13 to $15

p. 308
Communication Arts
Change $15 to $22

p. 309
Culture is Our Business
Out of Print

p. 312
Intelligent Life in the Universe
Change $2.95 to $3.25

p. 317
Systems Thinking
Change $2.65 to $4.25

Introduction to Cybernetics
Change $4.50 to $4.75

p. 320
Number Words and Number Symbols
Change $15.00 to $18.00

p. 323
Basic Electricity
Change $15.95 to $16.70 postpaid

Basic Electronics
Add "postpaid"

p. 326
Glyph
Defunct

p. 328
Electric Guitar Amp Handbook
Change $6.95 to $7.95

p. 333
Classic Guitar Construction
Change $6.95 to $8.95

p. 334
Gurian Guitars
Change "Gurian Guitars, Ltd., etc."
to Gurian Guitars, Ltd
Hinsdale, NH 03451

p. 340
Money Game
Change $1.25 to $1.50
Add "postpaid"

p. 352
Zone System Manual
Change $2.50 to $2.95
Change "from: Morgan & Morgan,
etc."
to Morgan & Morgan Inc.
145 Palisade Street
Dobbs Ferry, NY 10522

p. 353
Basic Photo Books
Charles Swedlund's A Guide to
Photography
Out of Print

p. 356
The Natural Way to Draw
Change $6.95 to $4.95

p. 366
How to Parent
Change $1.25 to $1.50

p. 368
Diary of an Early American Boy
Change $2.00 to $2.95

p. 374
Audubon
Change $10/yr to $13/yr

Natural History
Change $8/yr to $10/yr

p. 375
Patterns of Survival
Out of Print

p. 378
Worlds in the Making
Change $5.75 to $5.95

p. 387
Simple Working Models of Historic
Machines
Out of Print

p. 388
Guiness Book of World Records
Change $1.50 to $1.95

p. 391
Concise Guide to Library Research
Out of Print

p. 392
How to Solve It
Out of Print

Practical Cogitator
Change $6.95 to $2.65 postpaid
Change "from: Houghton, etc."
to Dell Publishing Co. Inc.
1 Dag Hammarskjold Plaza
245 East 47th Street
New York, NY 10017

p. 400
Crafts Design
Change $14.95 to $16.95

p. 407
The New Religions
Change $5.95 to $1.50
Change "from: Doubleday, etc."
to Simon & Schuster Inc.
One West 39th Street
New York, NY 10018
Attn: Order Dept.

p. 414
Hallucinogens
Change $27.50 to $14.75

p. 418
Sensitivity Books
Change NTL Institute for Applied
Behavioral Science address to
P. O. Box 9155
Rosslyn Station, VA 22209

p. 422
Self-Hypnosis
Change $2.00 to $3.00

p. 424
Kundalini
Change $2.25 to $3.50

p. 427
Masks of God - Primitive Mythology
Change $3.25 to $3.75

p. 428
Tibetan Book of Great Liberation
Change $2.95 to $3.95

p. 429
Zen Mind, Beginner's Mind
Change $2.50 to $2.95

p. 430
Teachings of Don Juan
Change $1.50 to $1.75

p. 432
Act of Creation
Change $1.95 to $2.75

p. 441
Whole Earth Truck Store
Change 540 Santa Cruz Avenue to
558 Santa Cruz Avenue

p. 572
Perfect Patchwork Primer
Change $9.95 to $3.95
Change "from: David McKay, etc."
to Penguin Books, Inc.
7110 Ambassador Rd.
Baltimore, MD 21207

p. 577
Alternate Christmas Catalog
Change to Alternate Celebrations
Catalogue
Change "from: Alternatives, etc."
to Alternatives
1501 Columbia Rd., N.W.
Washington, DC 20009

p. 579
Celery Wine
Change "Community Publications
Co-op" to Dunedain Press

p. 580
101 Practical Ways to Make Money
at Home
Out of Print

p. 587
S.O.S.
Change $4.95 to $9.95

p. 591
Tassajara Cooking
Change $3.95 to $4.95

p. 594
Old Fashioned Recipe Book
Change $10.87 to $12.45

p. 600
Gateway to Survival is Storage
Change $1.00 to $2.00

Family Storage Plan
Change $1.95 to $2.50

p. 611
A Child is Born
Change $3.95 to $4.95

p. 613
Donde No Hay Doctor
Change "Inquire" to $5.00 postpaid

p. 618
How to Do Your Own Divorce in
California
Change $5.20 to $4.95

p. 624
American Negro Poetry
Change $2.65 to $1.95

The Black Panther
Change $8.75 to $10.00

p. 637
Natural Food Guide to Europe
Out of Print

p. 644
How to Restore Your Model A
Change "from: Model A Ford, etc."
to Model A Ford Club of America
Box 1791
Whittier, CA 90603

p. 658
Winter Hiking & Camping
Change Glen Falls to Glens Falls

p. 659
Roughing It Easy
Change $5.00 to $4.95

p. 664
Indian Art of Tanning Buckskin
Change $2.95 to $3.95

p. 668
Air Travel
Change David Potvin to Dave Potvin

p. 669
Emergency Roadside Troubleshooting
Change to Emergency First Aid for
Your Car

p. 677
Calligraphy Supplies (Coit Pens)
Add Also available from
Bridgeport Pen Co.
Box 1206
Fairfield, CT 06430

p. 682
Books by Phone
Change 800-645-9040 to 800-228-9700

p. 685
Small Press Review
Change $5/yr. to $6/yr.

p. 690
Photographic Composition
Change $10.95 to $12.95

p. 693
Filmgoer's Companion
Change $3.95 to $5.95

p. 713
Watership Down
Change $6.95 to $2.25 postpaid
Change "from: Macmillan etc."
to Avon Book
250 West 55th St.
Order Dept., 8th floor
New York, NY 10019

p. 714
Folk Toys Around the World
Change $4.95 to $3.50 plus $1.00
postage
Change "from: Parents', etc."
to US Committee for UNICEF
331 East 38th Street
New York, NY 10016
or Whole Earth

p. 720
Escape from Childhood
Change $7.95 to $1.75

p. 725
Moviemaking Illustrated
Change $3.95 to $4.55

p. 728
Snakes: The Keeper and the Kept
Change $6.95 to $7.95

p. 729
102 Bird Houses, Feeders
Change $3.50 to $4.00

Learning from the Indians
Change $4.20 to $3.95

p. 735
Zen and the Art of Motorcycle
Maintenance
Change $7.95 to $2.25
Change "from: William Morrow, etc."
to Bantam Books, Inc.
666 Fifth Ave.
New York, NY 10019

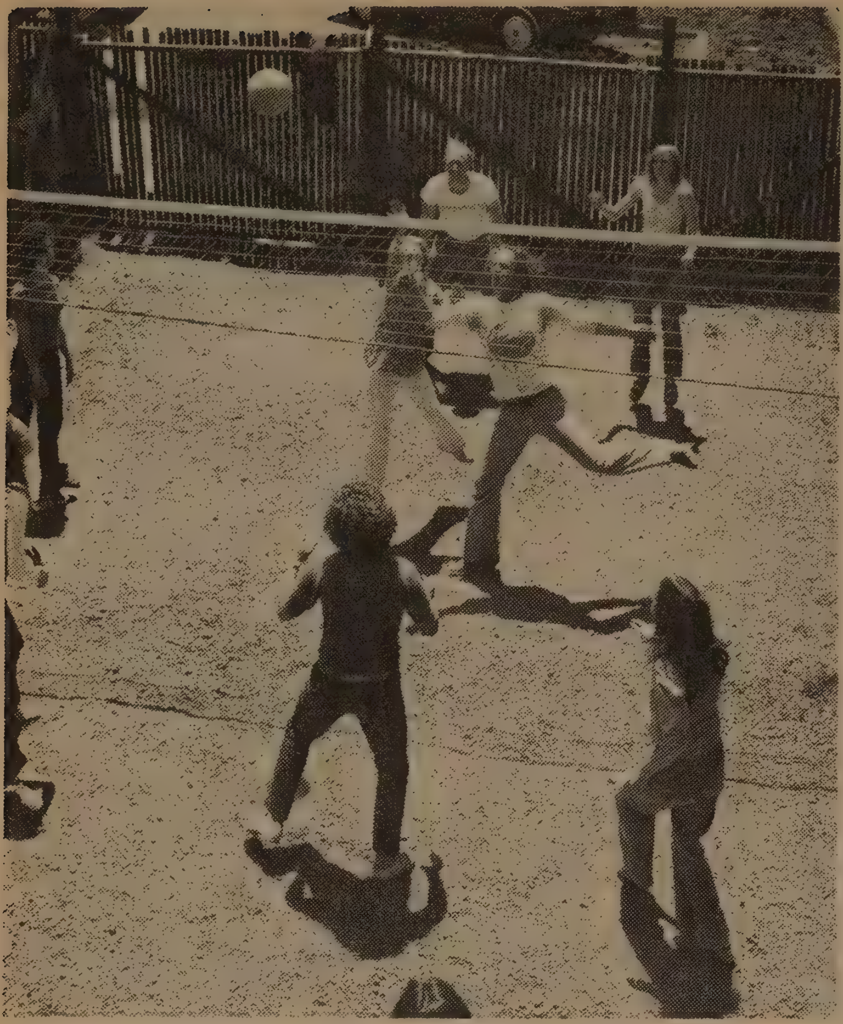
p. 739
Field Guide to the Psilocybin Mushroom
Change $1.25 to $1.45

p. 740
Uniquity
Change Dave Patvia to Dave Potvin

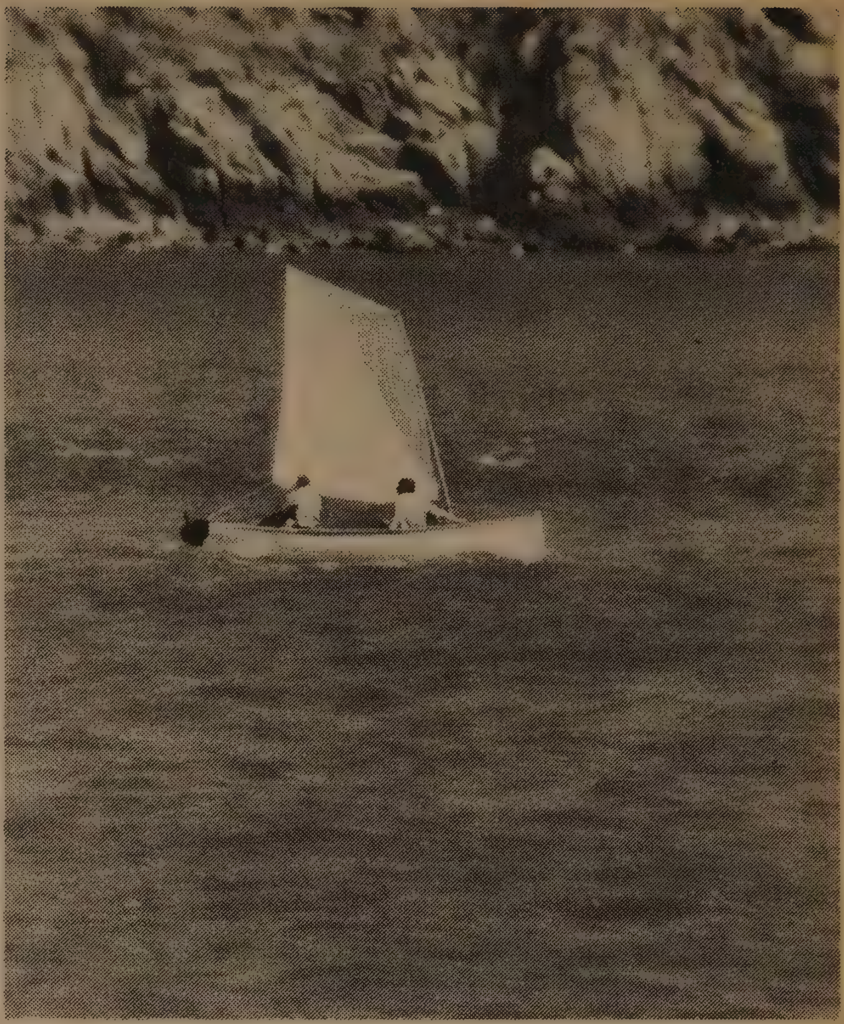
p. 743
Gospel of Christian Atheism
Change $3.00 to $1.75

p. 744
Matter of Zen
Change $2.45 to $2.95

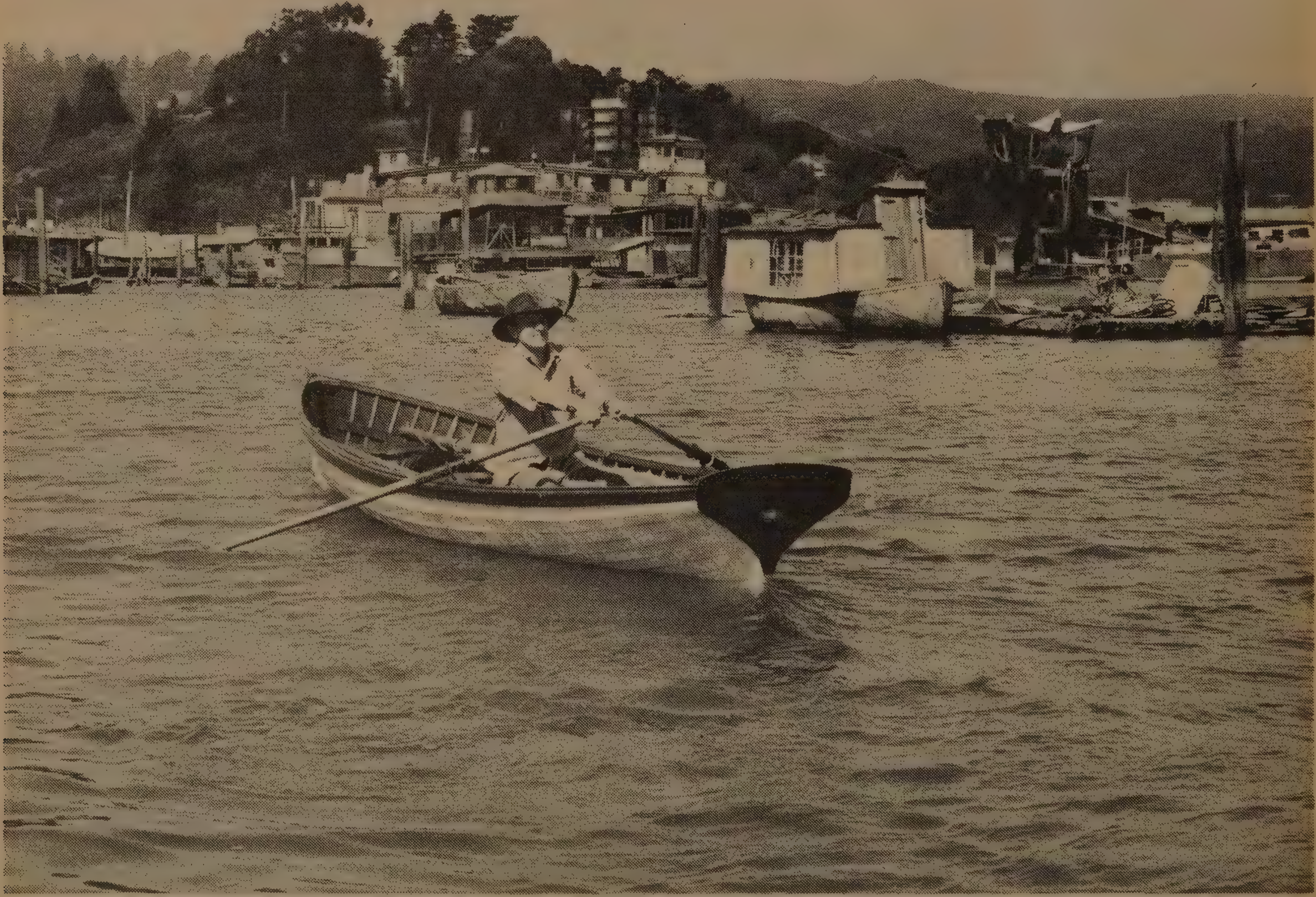
p. 746
Theravadin Centers
Change "Vipassana Centre, etc."
to Vipassana Centre
Valley Meditation Centre
Lynton, Devon, England


Andrew Main

Four-wall volleyball in the "courtyard". Left-to-right, front-to-back: Joy Byars, Andrew Fluegelman, Susan Roth, Andrea Sharp, Carol Kramer, J. D. Smith, Stewart Brand, Pam Cokeley.


John P. Huberty

Miss Whitehall, flying her spritsail, losing ground against wind and tide in Raccoon Strait. Quick work with oars saved the day — an option most sailboats don't have.


Diana Fairbanks

Arriving at work through the architecturally famous houseboat ghetto at Waldo Point, Sausalito. The swift Whitehall hull leaves so little wake it looks stationary in a still photo.

CoEvolution Quarterly Costs — Summer '75

Staff Salaries	$11,900
Contributors	4,800
Office	1,800
Production Supplies	2,500
Phone	900
Postage, Shipping, Subscriptions	2,000
Research	750
Printing (17,000 copies)	9,900
TOTAL	$34,550

The sobering reality is that it has cost us $2.03 per copy to produce a magazine that bears a $2.00 cover price. This situation is compounded by the fact that we won't sell our entire print run. About 10,000 copies will be shipped to booksellers, of which we can expect about 25% to be returned. About 3,000 copies will be sent to present and new subscribers. The rest we keep for reserves, review copies, and hopeful windfall interest in our publication. At $1.00 income per copy from booksellers and $1.50 from subscribers, we will lose about $22,550 putting out this Summer issue.

For the first time since we started a year and a half ago, we've given serious thought to reluctantly increasing the cover price. (Our first issue was 96 pages. This issue is twice that size — and no ads.) We've tabled that possibility for the moment, but we have firmly decided that the subscription rate will be held at $6.00 per year.

This "column" in each issue is written for the people who inquire about the economics of magazine publishing. New publishers take heed. And new subscribers, welcome.

— Andrew Fluegelman

The CoEvolution Quarterly

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Craft evaluations Diana Sloat
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(cover) Hatcher Trade Press, San Carlos, California

Gossip

We've re-established daily office volleyball — two games right after lunch just as in the old Whole Earth Truck Store days. It seems to make the day's work go better, and the office as a whole cohere better.

Financially Whole Earth has entered an austere period, its first since 1968. In the first quarter of '75 there were 60,000 more returns of WHOLE EARTH EPILOGs than there were sales, with the result that POINT suddenly owes Penguin Books $113,000. That is money we don't quite have, but a juggling of forthcoming income and considerable gentlemanliness from Penguin have solved the situation for now.

The CoEvolution Quarterly *operates at a loss of something like $8,000 a month, banking on previous CATALOG sales and building toward a "next" CATALOG. To put The CQ closer to self-sufficiency Andrew Fluegelman has embarked us on a subscription campaign, sending samples of our wares to bought or (rarely) traded mailing lists. Also we've bought full-page ads in* Publisher's Weekly *and* Library Journal *announcing The CQ, the move of the CATALOG distribution to Penguin, and the newly updated (to June '75) 16th edition of the CATALOG.*

To reduce office salary costs between CQ productions, which go one-month-on and two-months-off, the production staffers have commenced a free-lance typesetting and paste-up service using CQ production space and equipment during non-production months. Great idea — it was Diana Fairbanks' — if it works.

Another idea that's been in practice for three months now and looks to have proved itself is the uniform wage. Everyone in the office — after their first month — gets $5/hr. It reflects accurately the uniformly high level of skill, commitment, and unsupervised individual responsibility throughout the office. Only editing remains fiercely hierarchical. I get my income elsewhere, 15% of POINT's net income from EPILOG sales, valved at a maximum of $15,000/year.

Other personnel periodicities are emerging. Diana Barich likes to start the publication for a year (1968-69, 1973-74) and then ease herself out — returning at times for volleyball. J. D. Smith is off for a summer of rolling the logs to the saw at Burgdorf, Idaho. He'll be back in September to edit the Winter CQ so I can take a break. Richard Nilsen is in Hotchkiss, Colorado, getting serious about his 50-acre farm, and continuing to co-edit "Land Use" from there. Susan Roth, departing for Pennsylvania so her husband can attend Tyler Art School, has been replaced by Jeanne Campbell, an old-timer from Place *magazine. Recently she pasted-up the* Energy Primer *and the corrections and cross-references in the new CATALOG. On the volleyball court she is Godzilla.*

As for contributor gossip this issue . . . . The artist on p. 48, Carl Harp, is known as #126-516, "the Bellevue Sniper", at Washington State Penitentiary, where he is serving four life sentences. A book of his drawings costs $1 from King Publications, 601 19th St., N.W., Washington, DC 20006 . . . . Lynn Margulis (p. 31) and Carl Sagan (pp. 7 and 28) are not only colleagues and good friends, they used to be married to each other . . . . Dan O'Neill's character Cub Calloway (p. 24) is based on Kolchak, as played by Darren McGavin on the soon-to-be-dropped ABC series "The Night Stalker". "Best program on television," says O'Neill.

My life and commute have been enriched lately by a thing. It's a 16-foot lapstrake Whitehall rowboat superbly built this winter by Richard Shew and Cecil Burnham of South Bristol, Maine. She's all wood, of an 1850's class considered the peak of harbor workboat design. You could say I'm saving gas on the 3¼-mile row to work a couple times a week, but you'd have to discount the 4,000 U-Haul Van miles I drove from Maine. Miss Whitehall cost $2,000. I value her next to my friends, my work, and the place I live by the water.

She's not a bad model for the Quarterly, *a traditional, serviceable craft, built to last.*

— SB

Back issues

Summer '74, Fall '74 (Black Panther issue), Winter '74, Spring '75, and this one — Summer '75 — back issues of The CQ are available postpaid from us. (Spring '74 is sold out.) 1 copy: $2. 3 copies: $5. 4 copies: $6. More: $1 each. From Box 428, Sausalito, CA 94965.

A Plea to Subscribers

Since our readers tend to be nomadic, we've been receiving a large number of notices from the Post Office of CQ's that were not delivered because the subscriber moved (and didn't guarantee postage for 2nd class mail). In an effort to stay in touch with all our subscribers, we've been tracking down their new addresses, changing them on our records, and sending a copy of the missed issue to the new address. To do that, it costs us: $.10 postage due for notice of the undelivered mail, $.20 postage to mail a single copy of the CQ, $1.30 for the cost of the copy itself, plus the costs in dollars and energy to process all that.

If you're planning on moving, you can help us greatly if you'll let us know in advance, so we can get the next issue of the CQ to you promptly and efficiently. The best way to let us know your new address is to send us an address label from an old CQ, plus your new address (with zip code).

—Andrew Fluegelman

Subscribing to The CQ *saves both you and us 50¢ per copy.*

to: The CQ
Box 428
Sausalito, CA 94965

Please send me the next four issues of The CoEvolution Quarterly. Enclosed is my check for $6.

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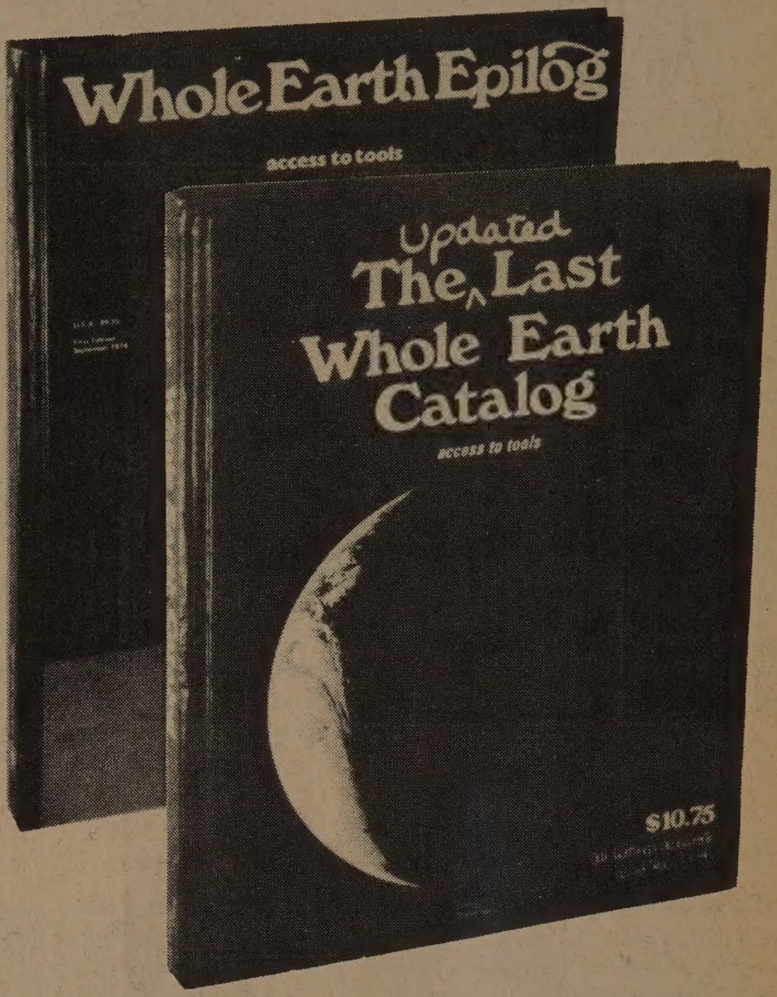

Hardcover Epilogs and Catalogs

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How Does The Apocalypse Look From Where You Are?

I think of it as the apocalypso.

— Jerry Hoffnagle
New York, New York

"COEVOLUTION"

The term was introduced in 1965 by Paul Ehrlich and Peter Raven in their study of the predator-prey relationship of caterpillars and plants. They found that the eaters and the eaten progressively evolved in close response to each other — coevolved. (Some plants developed defensive alkaloid poisons. Some caterpillars acquired a taste for alkaloids. The plants diversified wildly. The caterpillars diversified with them. What evolved really was the relationship, stably dynamic, unpredictable and sure.)

It seems that all evolution is coevolution. The beauty of the term is what it adds to the concepts of ecology. Language such as "preserving the ecology" suggests something quite perfect — static, knowable, oriented backward, unwelcoming to human foolishness . . . unreal. Ecology is whole system all right, but coevolution is whole system in TIME. The health of it is forward — systemic self-education which feeds on constant imperfection. We coevolving watchers and meddlers are not left out of it.

Ecology maintains.
Coevolution learns.

Monarch butterfly and caterpillar on milkweed.

A COEVOLUTIONARY GAME:
How the Acacia Got Its Teeth

In eastern Mexico lives a variety of acacia shrubs and marauding ants. Most acacias have thorns, bitter leaves, and other protection against a hungry world. One, the "swollen thorn acacia" learned to encourage a species of ant to monopolize it as a food source and kill or run off all other predators. Enticements gradually included nifty water-proof swollen thorns to live in, handy nectar fountains, and special ant-food buds at the leaf tips. The ants, whose interests increasingly coincided with the acacia's, learned to inhabit the thorns, patrol the acacia day and night, attack every acacia-hungry organism, and even prune away invading plants such as vines and tree seedlings that might shade Mother Acacia. The acacia gave up its bitter leaves, sharp thorns, and other devices and now requires the acacia-ant for survival. And the ant colonies can no longer live without the acacia. Together they're unbeatable. Moral? Useful now is necessary later.

This splendid study by Daniel H. Janzen of coevolved mutualism appeared in Evolution, Sept. 1966. Sent by Paul Ehrlich and Richard Holm.

A COEVOLUTIONARY GAME:
Corporation & Agency

Two supposedly antagonistic institutional subspecies, *Corporatii Monopolicus* and *Agencii Regulatori Federalus,* play a game that has enhanced their survival through a ritualized form of mock combat, which produces few casualties for either side. Its essential purpose is to facilitate the capture of their natural prey, the numerous, quick-breeding *Homo Consumerus.*

The key mechanism which makes this "cooperative combat" possible involves the use of a highly specialized parasite form, *Homo Attournicus Corporatus.* Both the above-mentioned social dynosaurs rely upon *Homo Attn. Corp.* for the smooth running of their everyday metabolic processes. Indeed, this unique parasite, which acts much like the benign bacteria in the intestines of organic life forms, is able to survive equally well in the bowels of either host. In fact, the most thriving of *Homo Attn. Corp.* are those who manage to transfer from one type of host to the other, the more times the better.

For the short run, these species' prey, *Homo Consumerus,* are abundant and easy hunting. But there are an increasing number of dangerous bacteria showing up in these species, some of which have been identified as the independent virus, *Homo Attournicus Publicus.* The effect of these strains of bacteria is hard to calculate, but it may involve a change in ecological relationships in favor of *Homo Sapiens* as a whole.

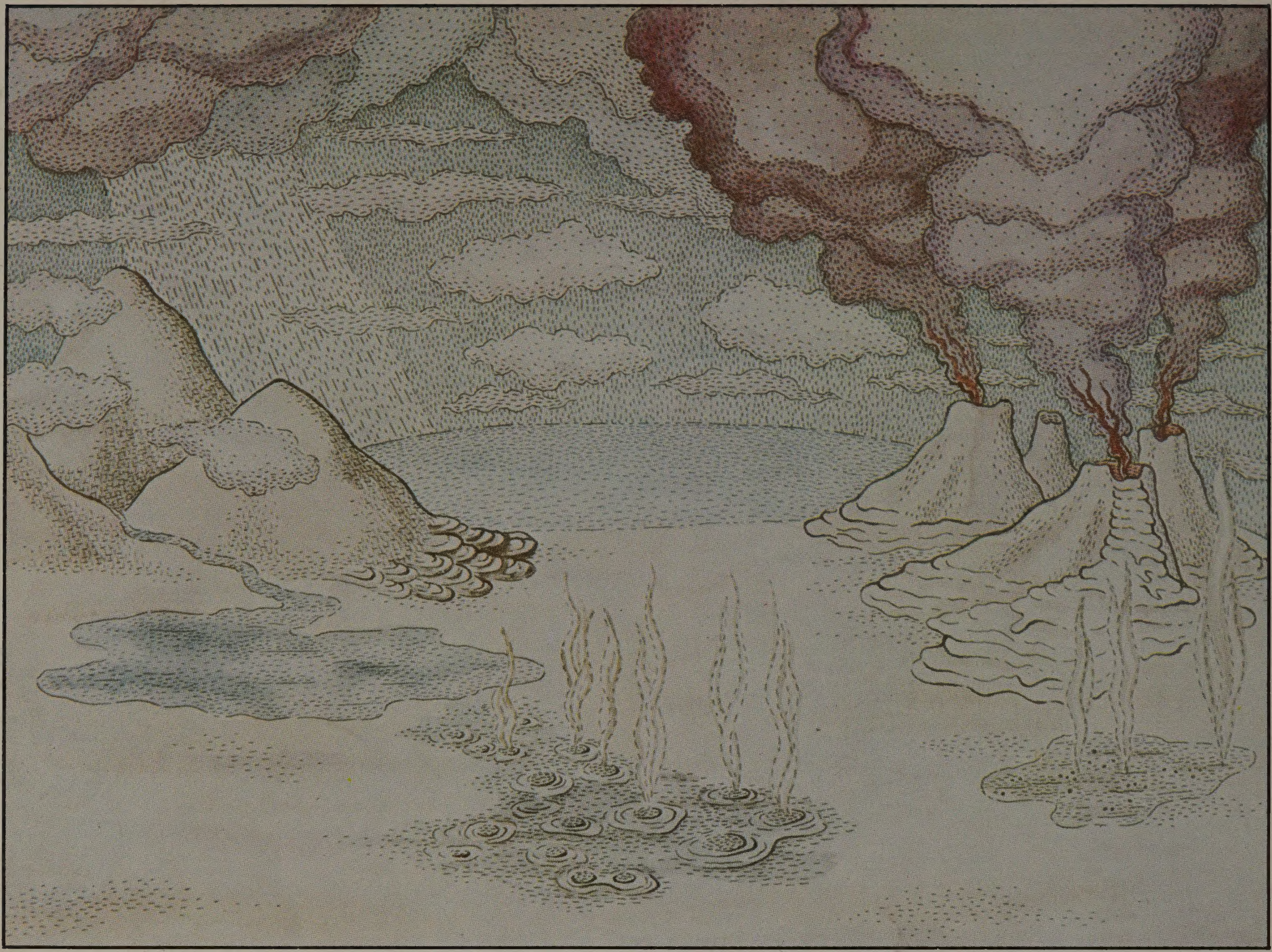
— C. H. Richards
Anacortes, Washington

A COEVOLUTIONARY GAME:
Who's Got the Cardiac Glycoside?

For chemical defense against predators, plants of the Milkweed family learned to synthesize a potent poison, the cardiac glycosides. The Monarch butterfly caterpillar learned to relish this alkaloid. The adult Monarch, full of cardiac glycosides, tasted terrible to his predators, the birds. The nice-tasting Viceroy butterfly learned to mimic the orange-and-black appearance of the Monarch so birds would leave him alone too. The birds, presumably, learned to distinguish more acutely between the real and bogus Monarchs. And the Milkweeds, meanwhile, learned to vary the combinations of alkaloids in individual plants so that caterpillars adapted to one plant could not feed on another. So long as everyone gets some victory and some defeat, the game never stops.

A COEVOLUTIONARY GAME:

(The CoEvolution Quarterly *will pay $20 for each CoEvolutionary game sent to us and published. The players may be life forms, organs, ideas, cultures, inventions, techniques, you name it and connect the circuit.)*



Scene from a geothermal area in Fig Tree times (about 3400 million years ago).

The Gaia Hypothesis

Scene from a geothermal area in Gunflint times (about 2000 million years ago).